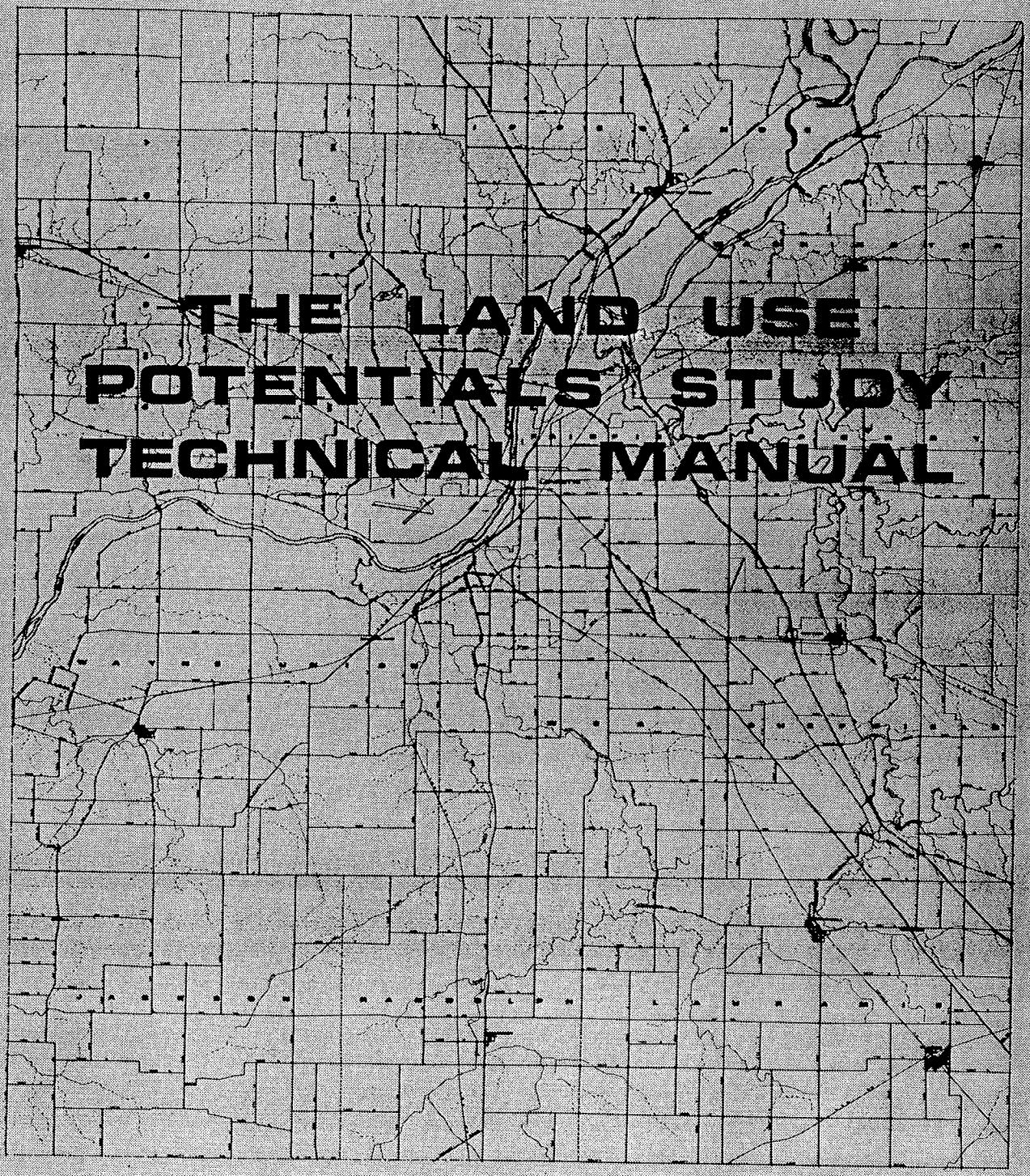

THE LAND USE POTENTIALS STUDY TECHNICAL MANUAL

VOLUME 1
THE COMPREHENSIVE PLAN FOR
TIPPECANOE COUNTY

THE COMPREHENSIVE PLAN FOR TIPPECANOE COUNTY

VOLUME 1:

THE LAND USE POTENTIALS SYSTEM TECHNICAL MANUAL

TIPPECANOE COUNTY AREA PLAN COMMISSION
County Office Building
20 North Third Street
Lafayette, Indiana 47901
317-423-9242

March 1981

Adopted by the TIPPECANOE COUNTY AREA PLAN COMMISSION on September 16, 1981, by the COMMON COUNCILS OF THE CITIES OF LAFAYETTE and WEST LAFAYETTE and the TOWN BOARDS OF DAYTON and BATTLE GROUND on October 5, 1981, and by the BOARD OF COMMISSIONERS, COUNTY OF TIPPECANOE, on October 19, 1981. Certified to and recorded by the Tippecanoe County Recorder on October 23, 1981.

THE TIPPECANOE COUNTY AREA PLAN COMMISSION, 1981

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The Tippecanoe County Area Plan Commission thanks those groups that have participated with Staff in the development of the Land Use Potentials methodology: the elected officials and appointed department heads of the Cities of Lafayette and West Lafayette, the Towns of Dayton and Battle Ground, and Tippecanoe County; the Citizens Participation Committee of the Area Plan Commission; the Greater Lafayette Chamber of Commerce Industrial Development Committee; and the League of Women Voters of Greater Lafayette.

This writer offers special thanks to present and former Staff members for their invaluable participation in this project. In addition to those of you named on the previous page, Janice Andres, Diane Burns, John Ledford, Gerald Overstreet, Lynn Pavelka, Bryn Smith and Terry Virta have all worked at thinking this effort through and in compiling, analyzing and portraying a small mountain of pertinent data. Particular thanks to Lynn Pavelka for the development of the residential use potentials system, and of course to Terry Virta, former Executive Director, for his inspiration, patience and pragmatism.

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I. INTRODUCTION

A. The Need for a New Methodology

Historically, those of us charged with the responsibility for planning the future use of land have had to depend heavily on our individual skills and our ability to apply generalized planning principles to specific locales. As such, land use planning has been more often an art than a science, and just as often the subject of great controversy in the community.

In order to provide ourselves with more substantial tools to tackle the considerable job of allocating sufficient land to meet the needs of a growing urban area in a highly productive agricultural setting, we have devised a series of techniques that place the process of land use planning more squarely in the realm of science.

Our methods quantify physical characteristics of land in order to establish potentials for various use categories. This removes the nebulous justification of "sound planning principles" from the process, and substitutes explicit decision-making models readily subject to public scrutiny and input. Furthermore our land use potentials methodology has allowed us to avoid other pitfalls too often associated with more intuitive methods.

Land use plans have tended to be demand-oriented and directional: they add more residential or commercial or industrial use areas at the far edge of like existing development, in quantities calculated to meet the needs of a population

projected to a future date. By allocating land that may be physically unsuited to a given use or intensity of use, or which may be better suited to another use, such plans may repeat or exacerbate historical mistakes. This can inadvertently create unnecessary problems of storm water management, water supply and sewage disposal, and can encourage the loss of nonrenewable resources of energy, prime farmland, natural landscaping and open space. Demand-oriented, directional plans can also tend to artificially limit locational and market choices by being unnecessarily inflexible.

While often adequate in providing for urban growth, planning has largely ignored the issue of prime agricultural land preservation and the conflicts that arise at the interface between expanding development and successful farming. Often, cropland is seen by the developer as well as the planner as being merely vacant and ripe for some higher (developed) use as urbanization inexorably overtakes the countryside. The ever-present and growing need to feed ourselves and others makes so cavalier an attitude improper and untenable.

The Area Plan Commission of Tippecanoe County, Indiana, serves the twin cities of Lafayette and West Lafayette, several small incorporated towns, and all unincorporated lands in the county. A ring of expanding suburb and extensive areas of remarkably productive soil, used to grow corn and soybeans, typify the unincorporated portions.

Farming is central to the local economy and much farmland has been lost to development here in recent decades. There is a worrisome and growing history of soil erosion and

septic system failure in newer rural subdivisions, indicative of a need for a closer look at the land itself before development. Additionally, there has been neither a strong tradition of planning nor trust in planners' judgment in the community at-large.

The above factors have provided the impetus for us to develop new and basic techniques which recognize physical characteristics of land as being central to potential use. We have designed these techniques to overcome problems associated with presently accepted planning methods, and have tailored them to the needs of the Commission and the 120,000 people it serves.

B. The Nature of the Methodology

Through the application of these techniques, basic planning information is generated by a decision-making model which aggregates information about the physical and locational characteristics of land and generates relative potentials for each of five possible land use categories. The information thus generated serves as a data base for a variety of planning activities, including the eventual land use plan itself. It must be stressed that the data generated is not the plan, but rather its justification; the methodology provides a compelling analytic tool in the planning process, but not the plan.

Basically, the land use potentials methodology consists of five major activities, as follows:

1. Build a decision-making model;

2. Decide where and how to apply it;
3. Assemble and portray all the information required by the model;
4. Apply the rules of the model to the assembled information and graphically portray the resulting land use data base; and
5. Create a land use plan from that data base.

Activities 3 and 4 are totally mechanical and can be readily accomplished by technicians. We have done this work by hand and it proved to be time consuming. However the work is ideally suited to computerized operation should that option be available.

The decision-making model, central to the entire process, can easily be made subject to open discussion and input from a wide range of participants. The potential for controversy in the subsequent planning process can thus be diminished because planning decisions will stem from a mutually accepted system of rules; there would be no need to rely solely on one or more planners' judgment.

Because this system can manipulate more raw data than an individual can comfortably handle, and because an extensive set of rules can be uniformly applied throughout a large study area, this system for generating land use potentials can be counted on to choose among competing land uses rationally and consistently. Additionally, because the system is not demand-oriented, areas of considerable development potential in less than the most obvious locations will be detected. Because the procedures are technical rather than intuitive the study can be readily replicated and updated in the future.

Beyond providing a compelling data base for land use planning, the processed information can be used to test alternative capital improvement scenarios and to provide advice to a land user seeking an appropriate site, as well as a land owner seeking an appropriate use.

What follows in the next two sections is a procedure manual and a diary of the development of the methodology. The procedure manual will allow us to replicate, redo, revise or expand our work as future needs arise. Hopefully, both sections will be useful to planners in other communities seeking to establish land use planning techniques responsive to both the need for urban expansion and the need to preserve nonrenewable resources such as energy, prime farmland and open space.

We gratefully acknowledge the work of the Toledo-Lucas County (OH) Plan Commissions staff. Their pioneering use of a decision-making model in land use planning provided a solid footing upon which we have built our own techniques. They would recognize much of what follows.

II. METHODOLOGY

What follows is a listing of those tasks which must be performed to replicate our land use potentials study as is. Many of these tasks have been evolved through trial-and-error by pretesting the entire methodology on a small but representative area of this county. A history of these trials and errors can be found in the next chapter. The philosophical basis for this work lies within the adopted Goals and Objectives of the Tippecanoe County Area Plan Commission.

A. The Decision-Making Model

The model we built is in the form of a matrix which indicates how various factors influence potential for use within various distinct but general land use categories (see FIGURE 1). Building the model then requires completion of the following three tasks:

TASK 1 - DETERMINE AND DEFINE ALL PERTINENT LAND USE CATEGORIES;

TASK 2 - ISOLATE THOSE FACTORS MOST LIKELY TO INFLUENCE THE FUTURE USE OF ANY GIVEN PIECE OF LAND;

TASK 3 - ESTABLISH THE INTERACTIVE RULES WHICH DEFINE HOW EACH FACTOR CAN BE EXPECTED TO INFLUENCE THE POTENTIAL FOR USE WITHIN ALL POTENTIAL USE CATEGORIES.

We decided to consider potential for use within five broad and distinctive land use categories:

RESIDENTIAL,
AGRICULTURAL,
INDUSTRIAL,
COMMERCIAL, and
OPEN SPACE.

FACTORS	RESIDENTIAL				AGRICULTURAL				INDUSTRIAL				COMMERCIAL				OPEN SPACE			
	2	1	0	-1	2	1	0	-1	2	1	0	-1	2	1	0	-1	2	1	0	-1
SOIL PRODUCTIVITY	LOW	MOD	HI	VHI	VHI	HI	MOD	LOW	LOW	MOD	HI	VHI	LOW	MOD	HI	VHI			ALL	
SOIL LIMITATIONS	SLIGHT		MOD	SEVERE			ALL		SLIGHT		MOD	SEVERE	SLIGHT		MOD	SEVERE			ALL	
TENDENCY TO FLOOD			ALL SOILS				ALL SOILS				ALL SOILS				ALL SOILS		FLOODING SOILS		ALL OTHER SOILS	
FORESTED		YES					YES					YES			YES		YES			
SANITARY SEWER	<1000 FT							<1000 FT	<1000 FT	1000 FT-1.5 MI		>1.5 MI	<1000 FT	1000 FT-.5 MI		.5 MI			ALL	
ACCESSIBILITY	PAVED <.5 MI	PAVED >.5 MI		MAJOR INSCTN OR R-O-W			ALL		MAJOR INSCTN .ST/FED R-O-W	PAVED <.5 MI	INTER-STATE R-O-W	PAVED >.5 MI	MAJOR INSCTN .ST/FED R-O-W	PAVED <.5 MI	INTER-STATE R-O-W	PAVED >.5 MI			ALL	
RAILROADS & AIRPORTS			> 300 FT	< 300 FT & PROX			ALL & PROX		< 300 FT	300 FT - .5 MI & PROX	> .5 MI				> 300 FT	< 300 FT & PROX		< 300 FT	> 300 FT & PROX	
CURRENT & EXPECTED USE	RES.			O.S.	AG.			O.S.	IND.			O.S.	COMM.			O.S.	O.S.			

FIGURE 1

LAND USE POTENTIALS DECISION-MAKING MATRIX

The RESIDENTIAL use category makes no distinctions as to density or housing configuration. Also, for purposes of this study, small neighborhood shopping nodes may be considered to be assumed within this use category. The AGRICULTURAL land use category ensures against the relegation of farming activities to an as-yet-undeveloped holding status. The INDUSTRIAL category is rather diverse, including airports, utilities and gravelling sites along with light and heavy manufacturing operations. The COMMERCIAL use category assumes activity beyond the neighborhood level, whether it be community-wide or regional in scope, or specific to the needs of interstate highway travellers. Park lands, recreational facilities, school sites, cemeteries and concentrations of undisturbed natural vegetation are all included in the OPEN SPACE land use category.

A list of eight factors most likely to influence land use was evolved through staff discussion and a series of short pretests of the efficiency and accuracy of the model. Other factors may well be involved, but their inclusion is likely to result in double-counting. The eight factors do not overlap in any significant way. They are:

SOIL PRODUCTIVITY - the relative ability of a given soil type to yield crops;

SOIL LIMITATIONS - the relative ability of a given soil type to withstand various kinds of development: its constructability;

TENDENCY TO FLOOD - whether or not a given soil type is regularly subject to ponding or stream or river flooding;

FORESTATION - a simple reference to the presence or absence of significant numbers of trees;

SANITARY SEWER AVAILABILITY - relative access to a trunk line known to have excess capacity;

ACCESSIBILITY - a measure of proximity to major and minor roadways and their intersections;

RAILROAD AND AIRPORT PROXIMITY - a distance measure to these major transportation facilities and their areas of influence; and

CURRENT AND EXPECTED USE - a generalized indication of how land is being used in the present, including all major development projects currently in the drawing-board stage or for which some form of official approval has been granted.

These factors describe the physical characteristics of soil and land as well as locational characteristics within the manmade infrastructure. As such these factors take into account issues of resource management, environmental protection and land use economics. The inclusion of a CURRENT AND EXPECTED USE factor ensures against generating planning information that runs contrary to reality.

As FIGURE 1 shows, a value - from +2 to -1 - has been assigned to each specific interaction between factor and potential use category. The range of values corresponds to the range of interactions as follows:

+2 = HIGHLY DESIRABLE,
+1 = MORE THAN ACCEPTABLE,
0 = NEUTRAL or NOT APPLICABLE or JUST ACCEPTABLE, and
-1 = USUALLY NOT ACCEPTABLE.

In this decision-making model each factor is given equal weight. We have no particular evidence to indicate that any one factor or group of factors is of greater influence than any others in determining potential for use within categories.

The interaction between SOIL PRODUCTIVITY and potential land use has been shaped by the adopted goal of the Tippecanoe County Area Plan Commission to preserve prime agricultural farm land. Thus very high productivity greatly

enhances AGRICULTURAL land use potential (+2), while the conversion of such land to RESIDENTIAL, INDUSTRIAL or COMMERCIAL development is discouraged (-1).

Much of the TENDENCY TO FLOOD factor has been eliminated because that information is accounted for in the SOIL LIMITATIONS factor, which is an aggregation of information on relative developability.

The FORESTED factor recognizes the advantage of wooded sites to some uses, as well as the often expensive nature of building amidst trees.

The SANITARY SEWER factor encourages development near existing infrastructure while recognizing the distances major users may be willing to traverse to reach mains having excess capacity.

The ACCESSIBILITY and RAILROADS AND AIRPORTS factors enhance RESIDENTIAL potential away from railroad lines and airports, while enhancing INDUSTRIAL potential at such intersections and in areas immediately adjoining rail and air facilities.

As a means of anchoring the data in reality, the CURRENT AND EXPECTED USE factor enhances potential in a land use category if that use already exists at a given location. Because this is just one of eight factors, CURRENT LAND USE does not become concretized, but the resulting data recognizes what has already been built. The conversion of current open space to any other use is penalized.

Further definition of the interactions between factors and potential use categories will follow in the section on data assembly and mapping.

B. Applicability of the Model

In order to apply the rules established in the decision-making model to the land area of the county itself, we needed to decide on the relative applicability of the system to existing land use patterns, and to determine an appropriate land area unit within which to make decisions about potential use. Thus:

TASK 4 - ESTABLISH BOUNDARIES THAT DISTINGUISH DEFINITIVELY URBAN AND RURAL SECTORS FROM THOSE LAND AREAS THAT LIE BETWEEN;

TASK 5 - CREATE A GRID PATTERN THAT DIVIDES LARGER LAND AREAS INTO CONVENIENTLY SIZED AND UNIFORM SQUARES OR CELLS, WITHIN WHICH FACTORS CAN BE EXAMINED AND DECISIONS MADE.

The land use potentials system permits us to apply a rational decision-making model to areas where the most difficult decisions must be made: those urbanizing sectors lying between what is clearly city and what is clearly country. Here competing land uses come into direct conflict. Application of the land use potentials system to purely rural situations produces somewhat less meaningful results simply because fewer development pressures exist. Such a system is of little value in already developed urban settings because current land uses will largely persist and because distinctions in physical characteristics are minimal or have for the most part been masked.

Consequently we divided the land in Tippecanoe County into three categories for land use planning: URBAN, URBANIZING and RURAL. FIGURE 2, the Tippecanoe County Study Area Map, demonstrates this division, and also delineates a typical section - that portion of Fairfield Township lying east of the urban boundary - to which all additional graphics in this volume correspond.

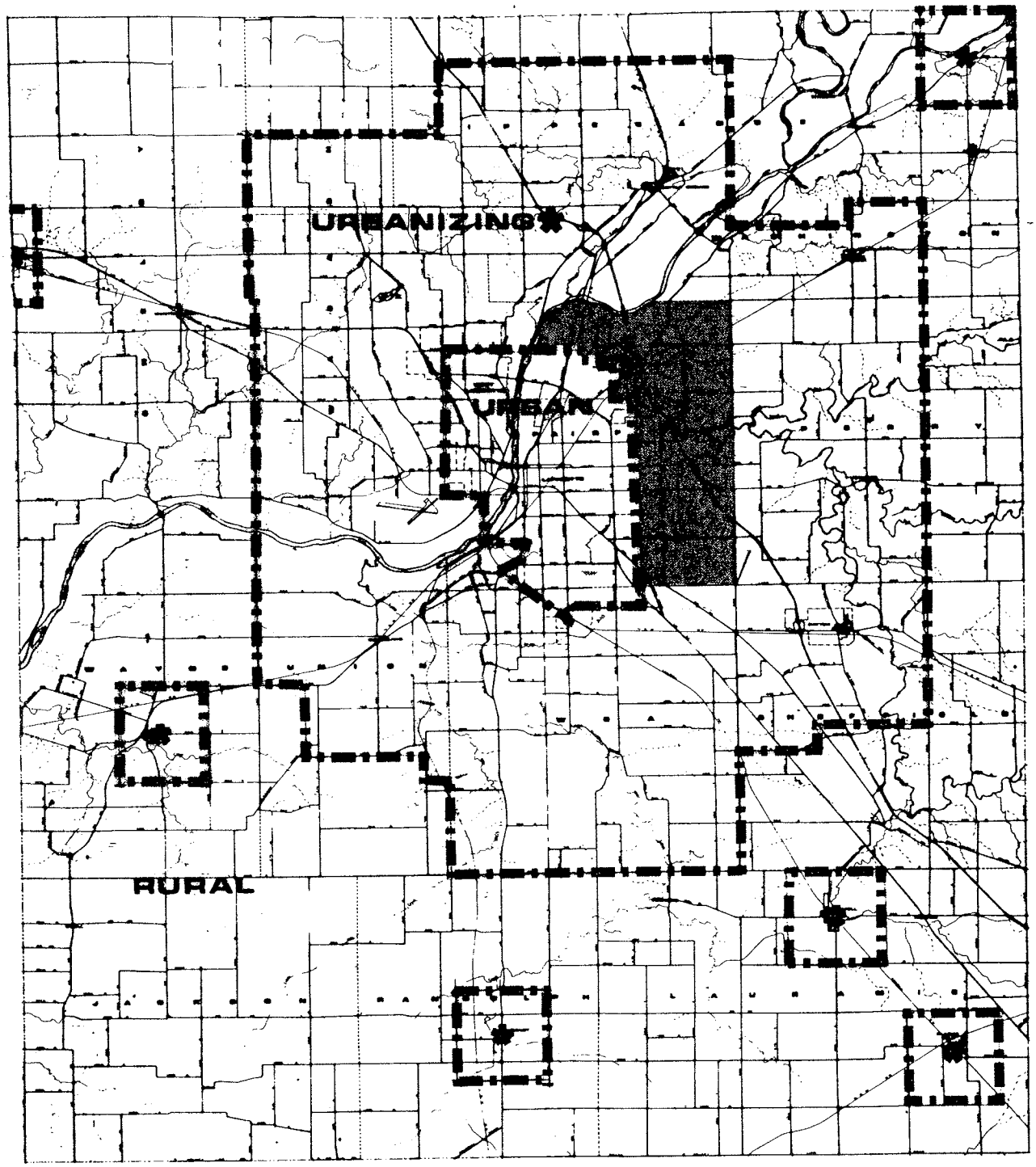
The URBANIZING sector was broadly drawn to amply cover all areas within the county even remotely likely to experience urban/rural land use conflict within an extended time frame. The sector thus takes on the form of an extensive ring surrounding the URBAN sector, and includes six satellites encompassing those small towns not otherwise falling within the ring. Because the URBANIZING sector requires the closest scrutiny with regard to determining use potential, a grid pattern was established dividing each square mile of land in this sector into thirty-six decision-making cells. Each cell, then, is an 880' x 880' square containing 17.78 acres. (FIGURES 12 through 16 exhibit the typical grid pattern associated with the URBANIZING sector.)

In keeping with the need to make fewer land use decisions beyond the URBANIZING boundary, each square mile of land within the RURAL sector was divided into sixteen decision-making cells, each a quarter-mile square encompassing forty acres of land.

The URBAN sector, then, is that portion of the county characterized by contiguous development associated with - but not necessarily coterminous with the corporate limits of - the two cities of Lafayette and West Lafayette. For purposes of land use planning, the URBAN sector has been treated in traditional fashion, with land use projections based on a block-by-block examination of current use and building conditions, with additional factual and intuitive input from local groups and professionals having specific knowledge about segments of the community. The URBAN sector has not been treated with these decision-making modeling techniques.

FIGURE 2

TIPPECANOE COUNTY STUDY AREA MAP



The original boundaries establishing the three sectors have undergone minor revision in order to conform to the applied grid patterns. Thus boundary lines initially following streams or curving roads were later readjusted to a more rectilinear configuration to ease the analysis process.

C. Data Assembly and Mapping

In order to be able to aggregate multi-factor data within decision-making cells, the data representative of each factor were assembled and individually portrayed on same-scaled maps.

TASK 6 - DETERMINE A SUITABLE MAP SCALE AND PROVIDE SUFFICIENT COUNTY BASE MAPS AND SOIL SURVEY MAPS AT THAT SCALE FOR MAPPING EACH FACTOR, AS WELL AS FOR FURTHER ANALYSIS AND DISPLAY;

TASK 7 - COLLECT THE DATA DESCRIPTIVE OF EACH FACTOR FROM ITS APPROPRIATE SOURCE;

TASK 8 - GRAPHICALLY PORTRAY THE FACTORS, EACH ON ITS OWN SAME-SCALED MAP.

To facilitate our work, reproducible mylars of our standard county base map and the local series of soil survey maps were created at a scale of 1"=3000', and prints made. At that scale each decision-making cell in the URBANIZING sector measured an ample .3" x .3", sufficient for easy reading of factor information and subsequent mapping of analyzed data.

The data descriptive of the eight factors selected proved readily available from local and in-house sources. The mapping of these factors is portrayed in FIGURES 3 through 10.

Please note that for graphic clarity the factor maps shown here have all been reproduced on a portion of the county base map; the actual versions of the three soil-related factor maps - SOIL PRODUCTIVITY, SOIL LIMITATIONS and TENDENCY TO FLOOD - were done on soil survey maps.

Information on SOIL PRODUCTIVITY was gathered from the most recently available Soil Survey, Tippecanoe County Indiana (U.S. Department of Agriculture, Soil Conservation Service, in cooperation with Purdue University Agricultural Experiment Station, U.S. Govt. Printing Office, Washington, DC, January 1959). A measure of "general productivity" - ranging from low to very high - is given for each of the county's 179 soil types in a chart (pp. 100-117) entitled "Soils of Tippecanoe County, Indiana: Summary of important characteristics." FIGURE 3 is a graphic representation of that data. The reader will notice large concentrations of very highly productive soils to the northwest and south, with most soils in the remaining portions rated high. (Note: For those soil types indicated in the chart as having a range of productivity - "medium to high" or "high to very high" - rather than a single description - "medium" or "high" - the higher value of that range was used for this study in all cases.)

Information on SOIL LIMITATIONS has been taken from USDA-SCS-Indiana Soil Survey Interpretation Sheets, prepared throughout the late 1970's. Data about relative levels of limitation - slight, moderate and severe - for "dwellings without basements" and "small commercial buildings" were used in the study. FIGURE 4 shows a pattern of generally severe limitations northwest and south, mostly moderate

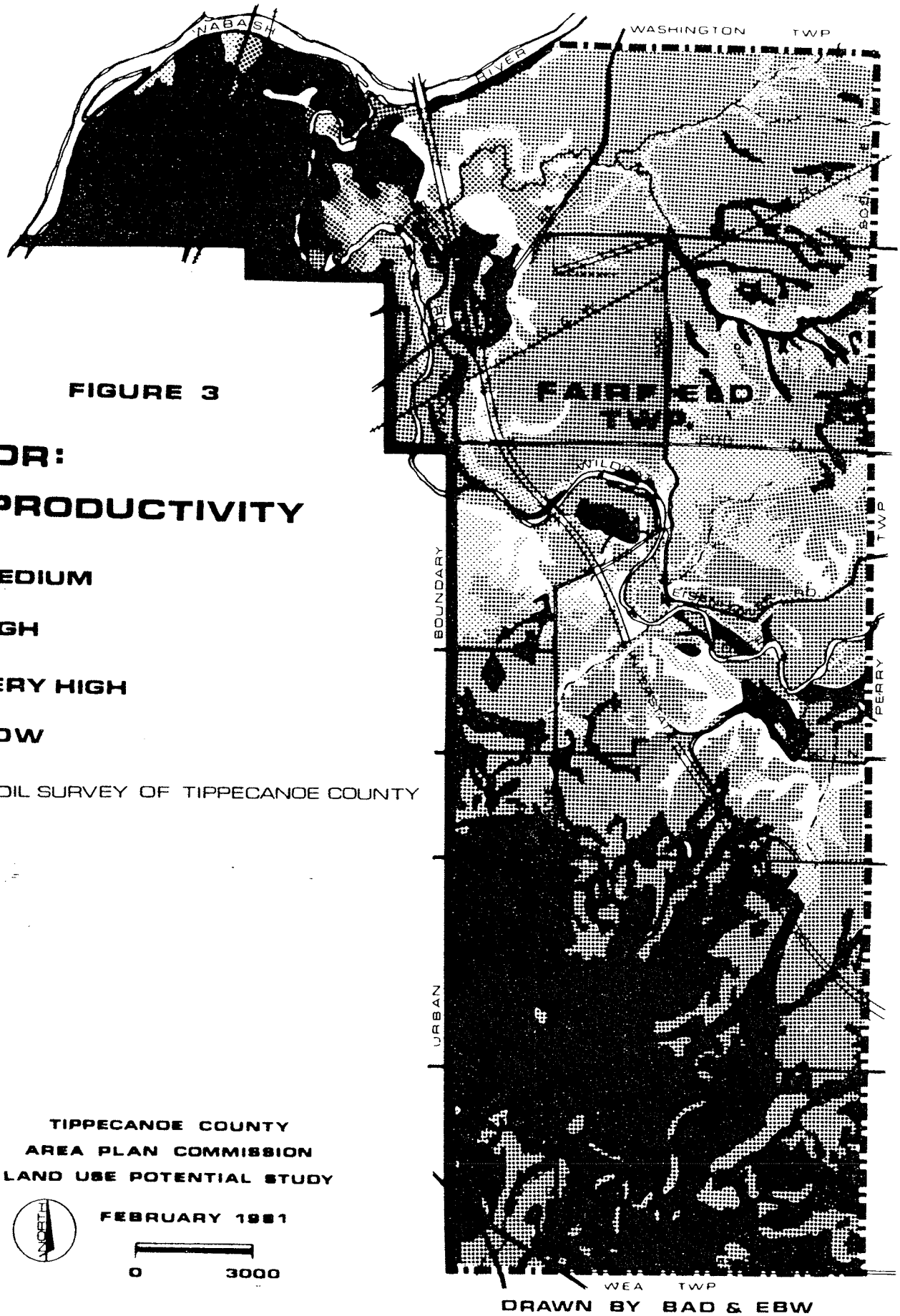


FIGURE 3

FACTOR:
SOIL PRODUCTIVITY

- MEDIUM
- HIGH
- VERY HIGH
- LOW

SOURCE: SOIL SURVEY OF TIPPECANOE COUNTY

TIPPECANOE COUNTY
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LAND USE POTENTIAL STUDY

FEBRUARY 1981

NORTH

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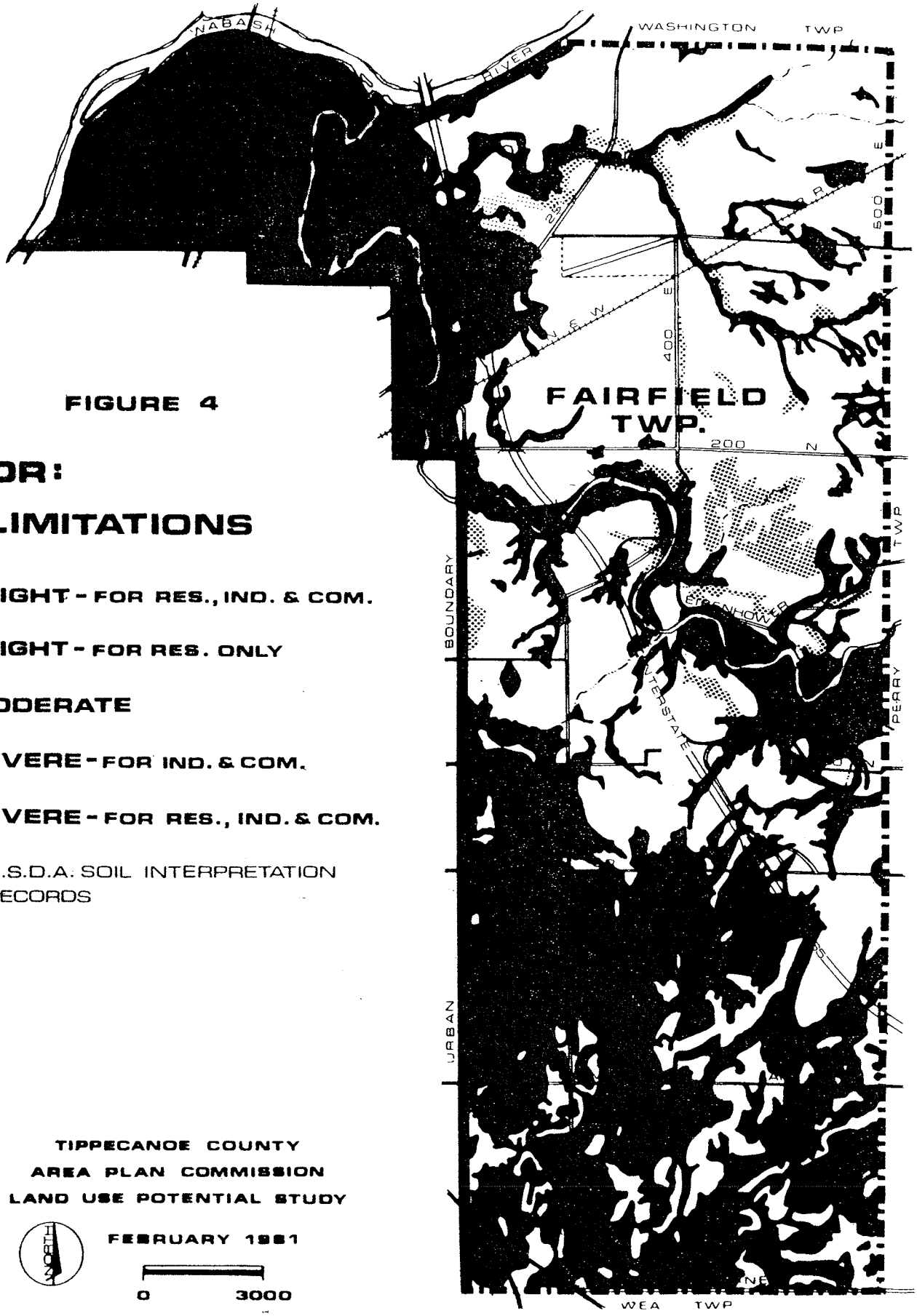

FIGURE 4

FACTOR: SOIL LIMITATIONS

- SLIGHT - FOR RES., IND. & COM.
- SLIGHT - FOR RES. ONLY
- MODERATE
- SEVERE - FOR IND. & COM.
- SEVERE - FOR RES., IND. & COM.

SOURCE: U.S.D.A. SOIL INTERPRETATION RECORDS

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AREA PLAN COMMISSION
LAND USE POTENTIAL STUDY

FEBRUARY 1981

NORTH

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limitations elsewhere. Appropriate definitions from the Technical Guide accompanying the interpretation sheets are as follows (April 1975, p. 4):

> Dwellings are not more than three stories high and are supported by foundation footings placed in undisturbed soil. The features that affect the rating of a soil for dwellings are those that relate to capacity to support load and resist settlement under load, and those that relate to ease of excavation. Soil properties considered are wetness, susceptibility to flooding, density, plasticity, texture, shrink-swell potential, slope, depth to bedrock, and content of stones and rocks.
>
> Small commercial buildings include small industrial buildings, buildings for commercial enterprises, or utility buildings for recreation developments. The buildings are no more than 3 stories high. Ratings are similar to those for dwellings, except the limitations usually are greater as slope increases because of larger area needed. Susceptibility to sliding, shrink-swell potential, slope, susceptibility to flooding, depth to bedrock, compaction characteristics, bearing value, and compressibility are the principal features that determine the limitations of most soils.

(Note: Because of the limitations of the data available, soil limitations for "small commercial buildings" as defined above, served as a proxy for industrial construction as well. As such, the SOIL LIMITATIONS factor, as it pertains to potential for INDUSTRIAL land use, may be somewhat understated.)

The Soil Interpretation sheets provided information on each soil's TENDENCY TO FLOOD. Alluvial and organic soils are generally found in the flood plains adjacent to rivers and streams; the other flooding soils are upland soils having a predictable tendency for ponding. These distinctions

lost some relevance to the study when revisions in the decision-making model combined their significance. The broad flood plain of the Wabash River and the lesser flood plain alongside Wildcat Creek and a pattern of wet soils to the south are all distinguishable in FIGURE 5.

FORESTED AREAS, as seen in FIGURE 6, were mapped from our 1976 series of aerial photographs. Note the general absence of trees other than along the banks of the Wildcat Creek.

The county is served by nine municipal and private SANITARY SEWER systems. FIGURE 7 shows trunk lines with excess capacity in that portion of the study area, those sites already being served by the trunk lines, and indicates distances - within 1000', within ½ mile, within 1½ miles - from trunk lines for land adjacent to, but not yet served by those lines. The graphic shows a concentration of lines, sewered sites and tap-on potential in the central and southern portions of the township. (Note: The municipal systems are operated in Lafayette, West Lafayette, Dayton, Battle Ground, Clarks Hill and Otterbein. Three private systems - American Suburban Utilities, West Lafayette Regional Sewer District and the Purdue University system - connect to the West Lafayette municipal system. For purposes of mapping the data, the following rules were observed:

- -A tract was considered sewered if directly served by a sanitary sewer line;
- -If sewer were available to any portion of a large single-owner tract, the entire parcel was considered to be sewered;
- -Force mains were considered to have tap-on potential only at the point of tap-on, that is, the pumping stations;
- -Systems with capacity problems - American Suburban and Battle Ground - or jurisdictions only within corporate limits - Dayton - were considered to have no tap-on potential;

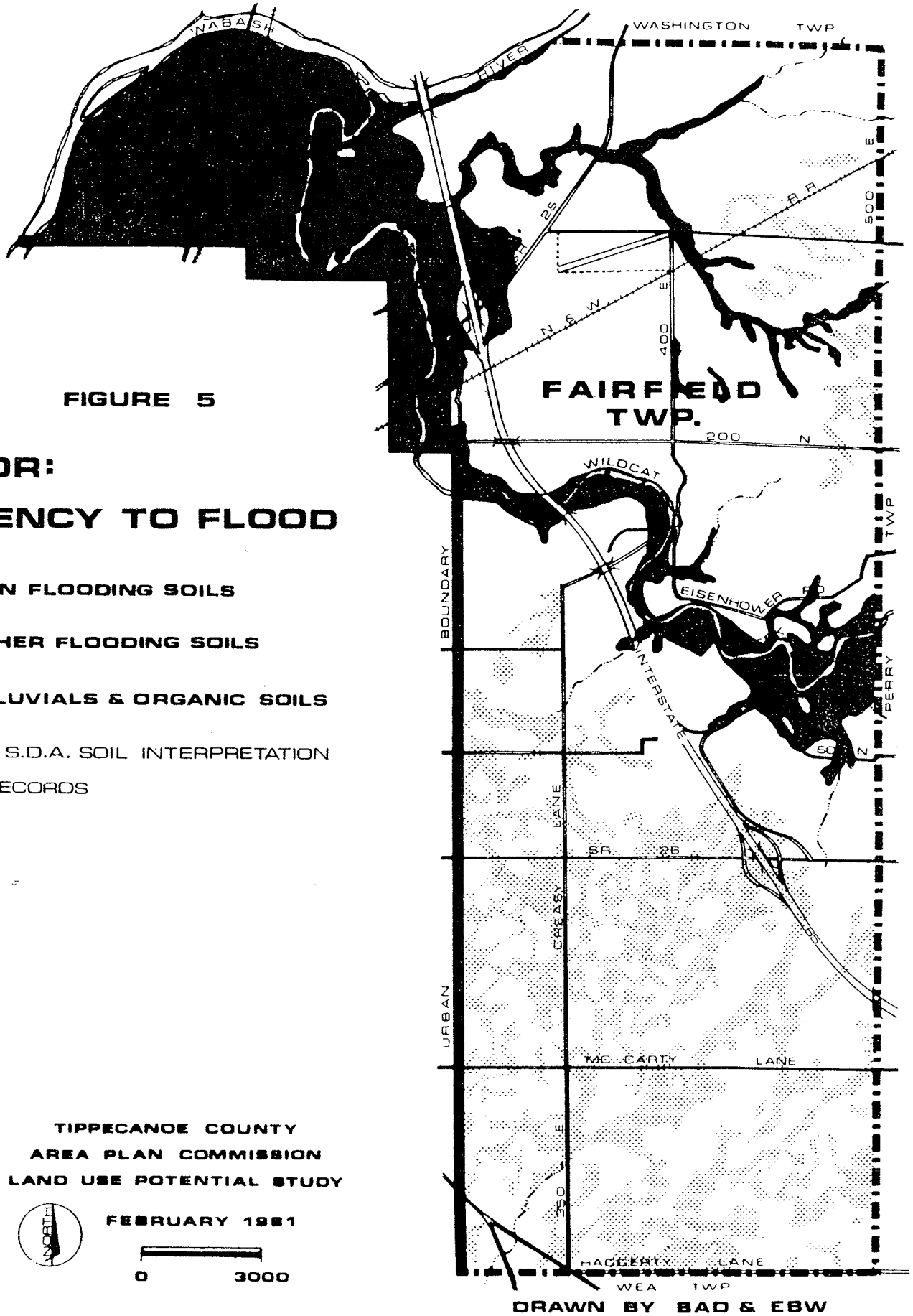

FIGURE 5

FACTOR:
TENDENCY TO FLOOD

NON FLOODING SOILS

OTHER FLOODING SOILS

ALLUVIALS & ORGANIC SOILS

SOURCE U.S.D.A. SOIL INTERPRETATION RECORDS

TIPPECANOE COUNTY
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NORTH

FEBRUARY 1981

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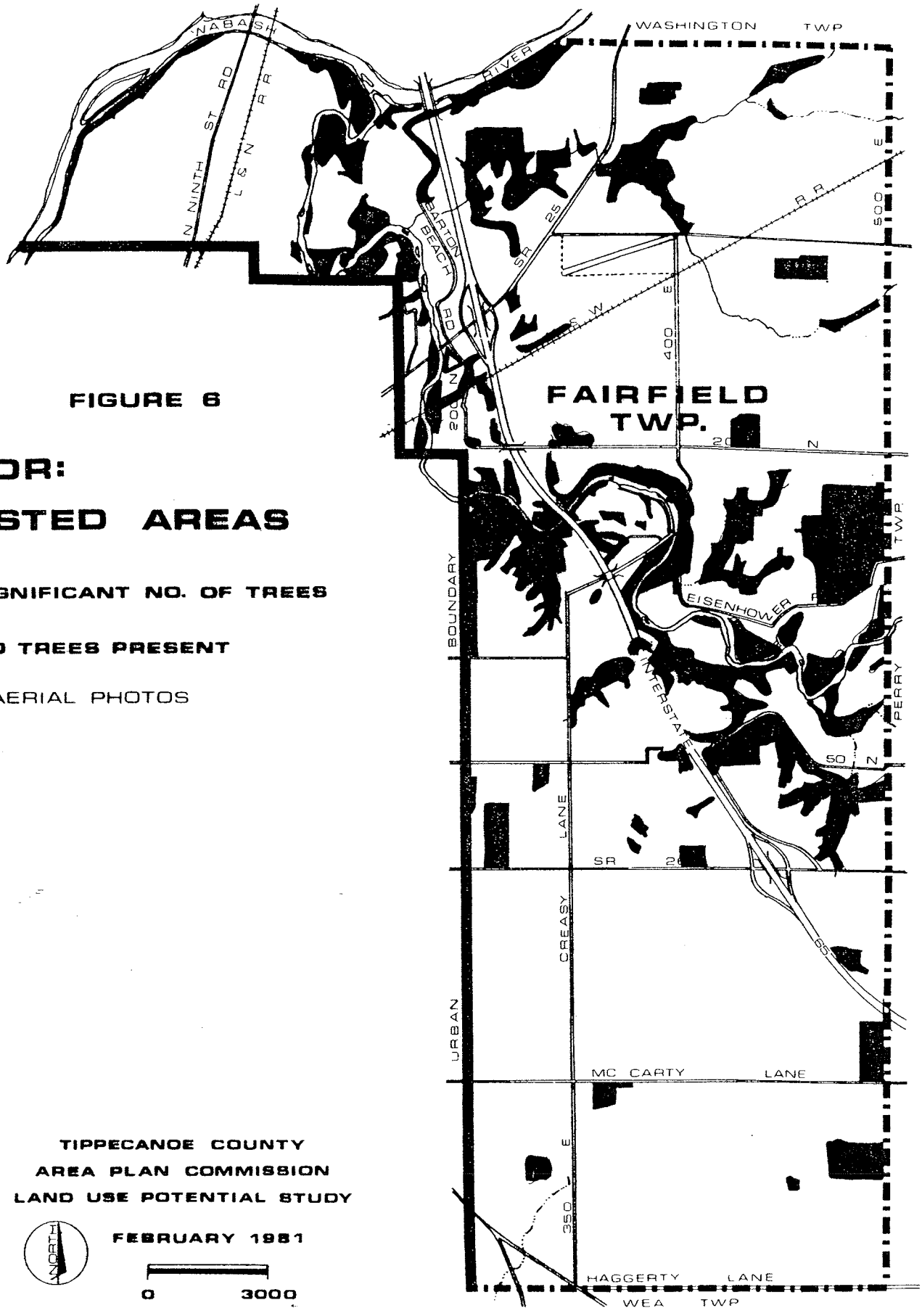

FIGURE 6

FACTOR:
FORESTED AREAS

SIGNIFICANT NO. OF TREES

NO TREES PRESENT

SOURCE: AERIAL PHOTOS

TIPPECANOE COUNTY
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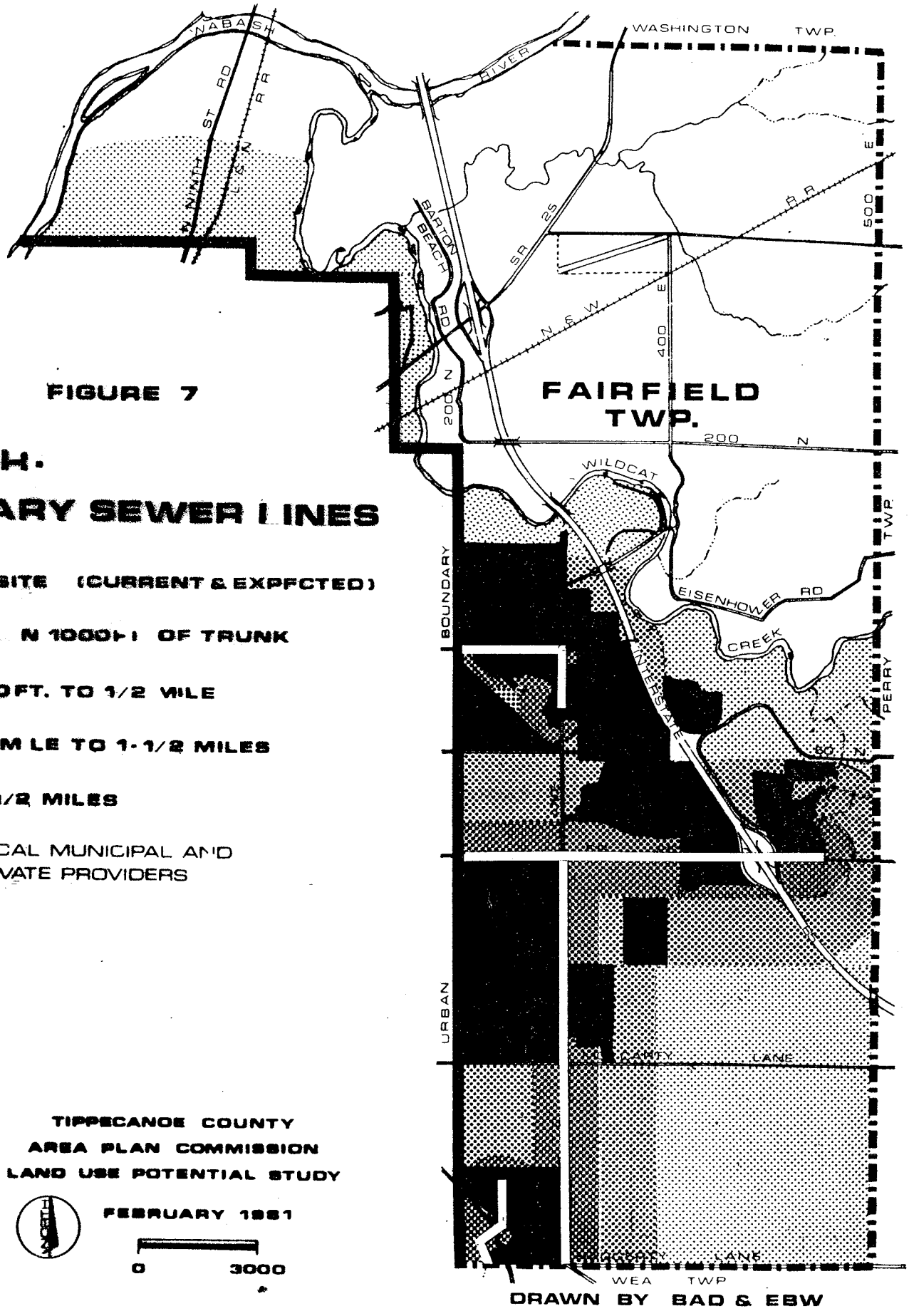

FIGURE 7

FA UH.

S NITARY SEWER LINES

- SITE (CURRENT & EXPFCTED)
- N 1000FT OF TRUNK
- 1000FT. TO 1/2 MILE
- 1/2 MILE TO 1-1/2 MILES
- 1-1/2 MILES

SOURCE LOCAL MUNICIPAL AND PRIVATE PROVIDERS

TIPPECANOE COUNTY
AREA PLAN COMMISSION
LAND USE POTENTIAL STUDY

FEBRUARY 1981

NORTH

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DRAWN BY BAD & EBW

-the West Lafayette Regional Sewer District, which provides service to a single subdivision within its legal service area, was considered to have tap-on potential only to the limits of that service area.)

FIGURE 8, depicting roadway ACCESSIBILITY, shows most of the township to be located within ½ mile of some paved road. Additionally the presence and influence of three state highways, an interstate highway, and their intersections can readily be seen. Data on the location and extent of paved roads was provided by the County Highway Engineer; chip-and-seal surfaces are considered paved. (Note: For mapping purposes, the ½-mile influence of paved roadways was curtailed by several manmade and natural barriers. Thus, rivers and streams wide enough to require bridging were treated as a barrier to accessibility regardless of distance from a paved surface. The interstate highway, other than at established crossing points, was also considered a barrier to the influence of a paved roadway within ½ mile. However drainage ditches were not considered to be a similar hindrance. Definitions of terminology used in the decision-making model with regard to the ACCESSIBILITY factor are as follows:

-"Major intersection" means the area within a ¼-mile radius of either the intersection of two state and/or federal highways, or the intersection of all interstate highway entry and/or exit ramps with any other roadway;

-"State/Federal right-of-way" and "Interstate 65 right-of-way" - either = "Major right-of-way" - mean areas within 300' of the actual rights-of-way. I-65 right-of-way is superceded by its corresponding major intersection.)

Data noting the location of RAILROADS AND AIRPORTS is mapped in FIGURE 9. Notice the township is crossed by two railroad lines and contains one small airport. Also, an airport located in an adjacent township exerts some influence here at the southeast corner. (Note: The term "proximity" used in the decision-making model includes the area within 2000' of an airport boundary plus 3000'-wide-by-one-nautical-mile-long areas beginning at the ends of all runways. These measurements correspond to state regulations regarding the height of structures and the placement of noise sensitive uses in the vicinity of airports.)

The generalized CURRENT AND EXPECTED LAND USE of the area is shown in FIGURE 10. Although there is a scattering of residential use throughout much of the township, a discernable concentration can be seen in the central portions, adjacent to the urban boundary. Agricultural land use predominates to the northwest, northeast and southeast. Land used or expected to soon be occupied by industrial use is found to the southwest; a second concentration at the north end is in actuality a gravelling operation and a small airport. Commercial uses are by and large found along the major roadways and interchanges. Most open space land corresponds to the wooded slopes associated with the Wildcat Creek valley. With the exception of a few platted but as-yet unbuilt residential subdivisions and the southernmost portion of the large industrial block, this graphic represents land use current at the time of this staff's most recent land use survey, conducted about three years ago.

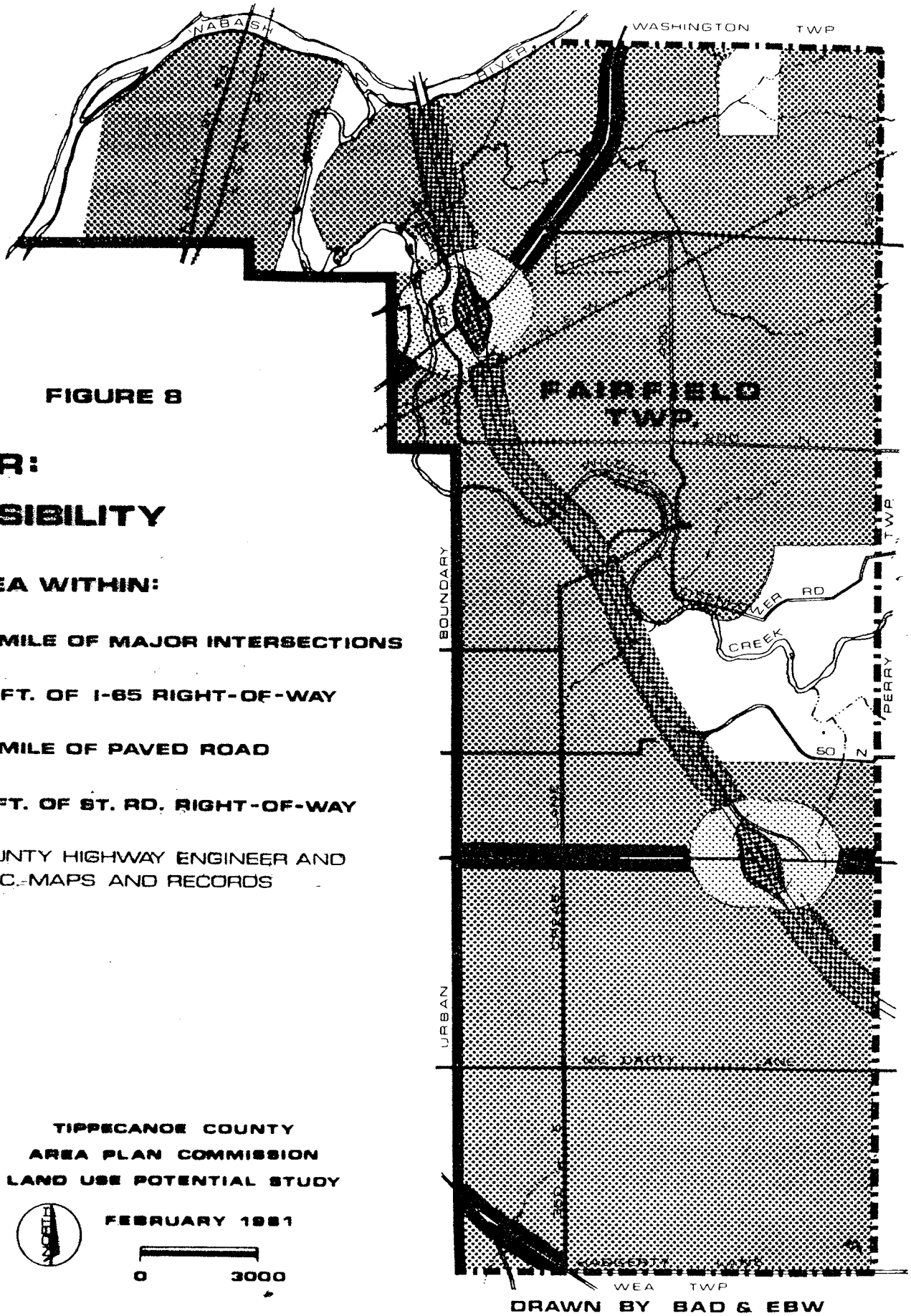

FIGURE 8

FACTOR: ACCESSIBILITY

AREA WITHIN:

- 1/4 MILE OF MAJOR INTERSECTIONS
- 300 FT. OF I-65 RIGHT-OF-WAY
- 1/2 MILE OF PAVED ROAD
- 300 FT. OF ST. RD. RIGHT-OF-WAY

SOURCE: COUNTY HIGHWAY ENGINEER AND A.P.C. MAPS AND RECORDS

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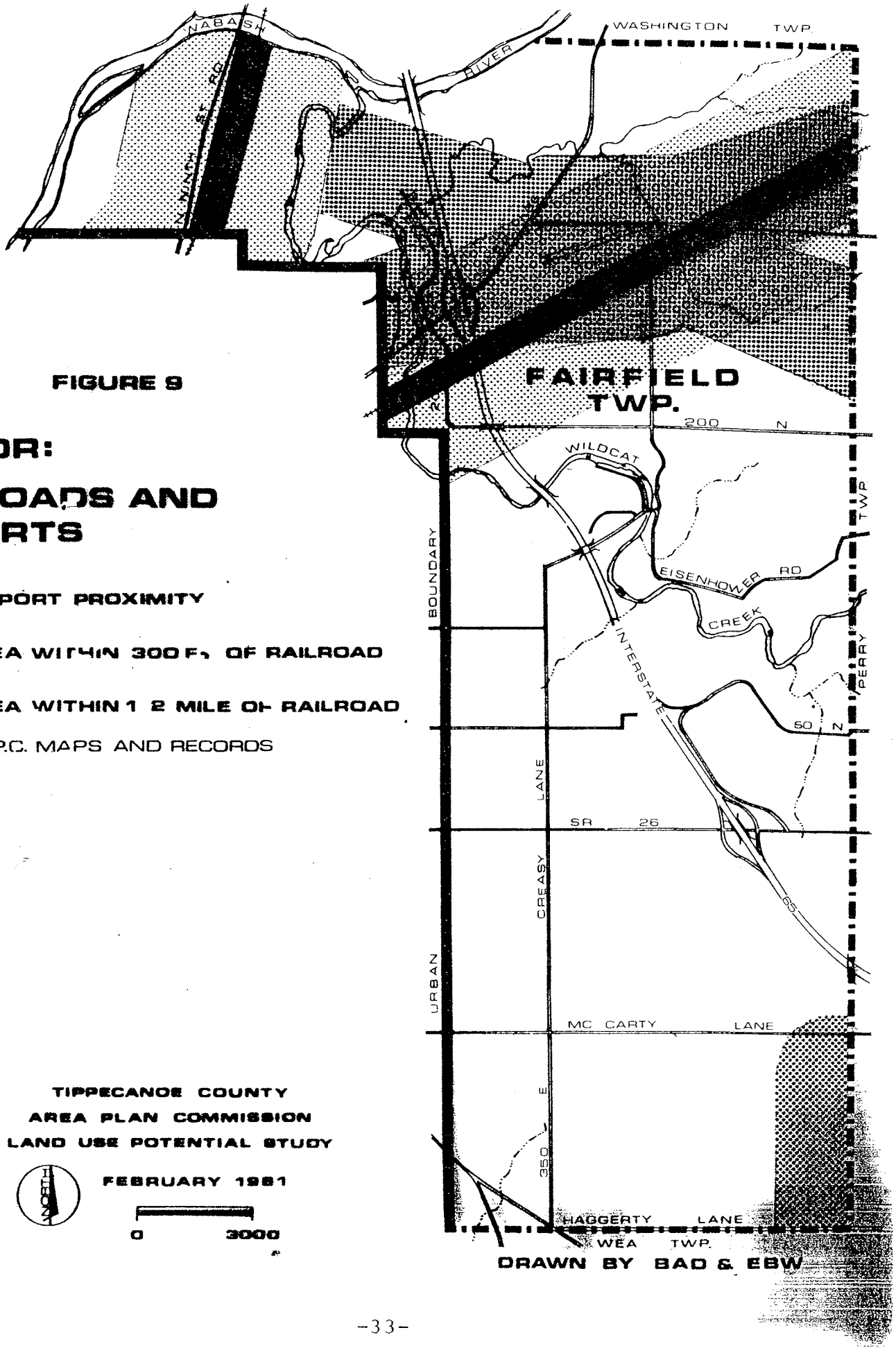

FIGURE 9

FACTOR:

RAILROADS AND AIRPORTS

AIRPORT PROXIMITY

AREA WITHIN 300 FT. OF RAILROAD

AREA WITHIN 1/2 MILE OF RAILROAD

SOURCE: A.P.C. MAPS AND RECORDS

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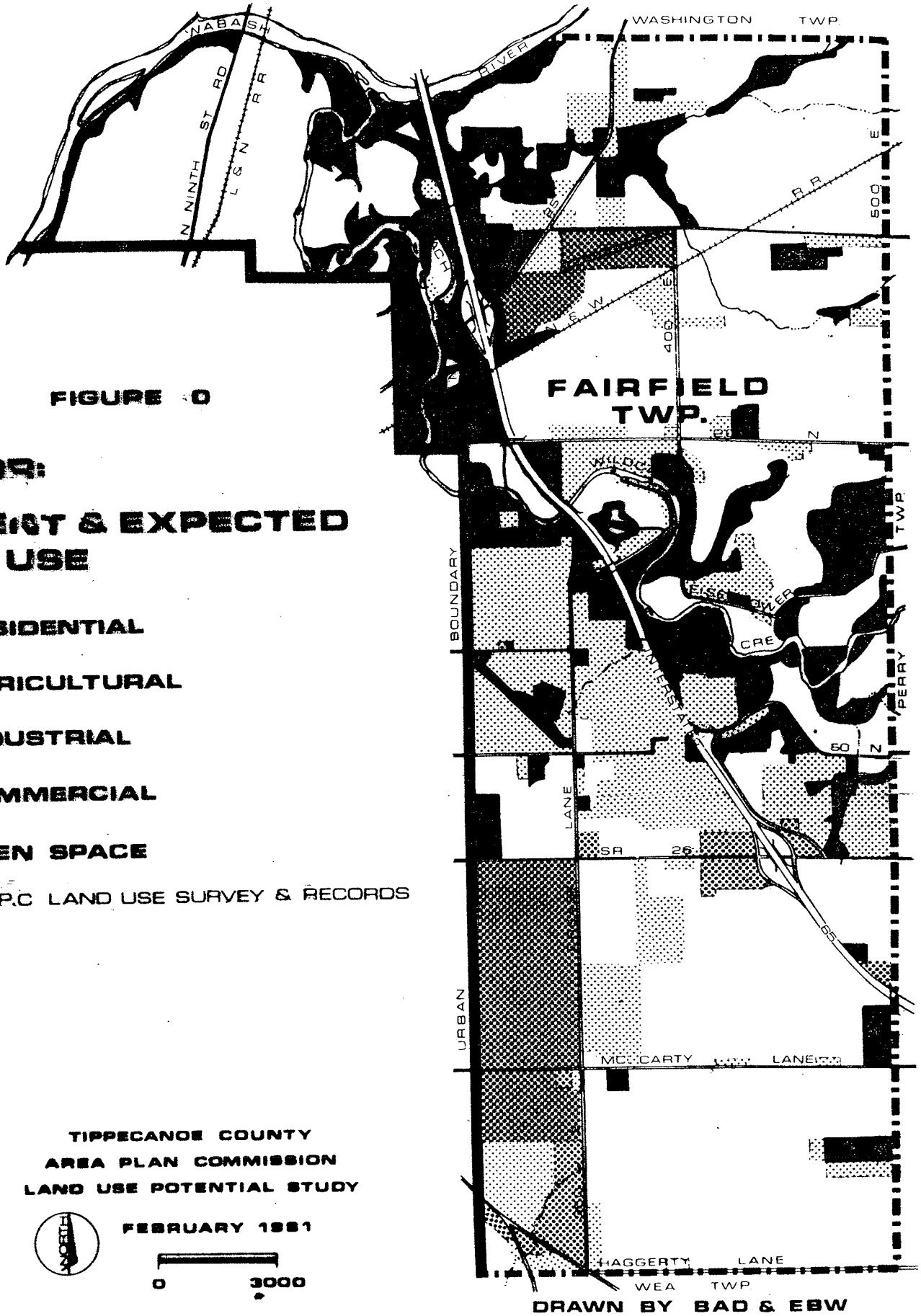
FIGURE 10

FACTOR:

CURRENT & EXPECTED LAND USE

- RESIDENTIAL
- AGRICULTURAL
- INDUSTRIAL
- COMMERCIAL
- OPEN SPACE

SOURCE A.P.C LAND USE SURVEY & RECORDS



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D. Application of the Model to the Factor Maps and Graphic Portrayal of the Land Use Potentials Data Base

Having created a grid of decision-making cells and the set of rules that are to be applied to each factor within each cell, what remains then is the aggregation, analysis and graphic portrayal of the land use potentials data base which then serves as the factual foundation for planning processes.

TASK 9 - CREATE TRANSPARENT SCORING GRIDS AT THE SAME SCALE AS THE FACTOR MAPS AND SCORE-SHEETS ON WHICH TO RECORD AND AGGREGATE NUMERICAL DATA;

TASK 10 - USING THE SCORING GRIDS APPLY THE RULES OF THE DECISION-MAKING MODEL TO ALL EIGHT FACTOR MAPS FOR THE ENTIRE STUDY AREA;

TASK 11 - ADJUST THE AGGREGATED NUMERICAL DATA TO ACHIEVE COMPARABILITY ACROSS LAND USE CATEGORIES AND RELATIVITY WITHIN EACH CATEGORY;

TASK 12 - PORTRAY THE ADJUSTED DATA ON RELATIVE LAND USE POTENTIALS MAPS, ONE FOR EACH OF THE FIVE LAND USE CATEGORIES.

To make the scoring process less cumbersome the eight factor maps were each cut into thirteen pieces, representing the thirteen civil townships within the county. A frosted mylar scoring grid was then prepared for each township at the same scale as the factor maps. The internal gridwork within each transparent scorer corresponded to the urbanizing/rural classifications already established. Individual township grids contained either all small cells (36 per square mile) or all large cells (16 per square mile) or a combination of both, depending on a township's location in the county.

Scoresheets were prepared to record the values generated when one: places the scoring grid over each factor map in succession; determines the nature or presence or absence of each factor

in each cell; and, by reference to the decision-making model, establishes the numerical value of the interaction within each portential use category. For example, when a scoring grid is placed over the SOIL PRODUCTIVITY factor map, it is seen that the soils in hypothetical Cell A are rated "very high." According to the model (see FIGURE 1), the following values are to be recorded: RESIDENTIAL -1, AGRICULTURAL +2, INDUSTRIAL -1, COMMERCIAL -1, OPEN SPACE 0. By then placing the scoring grid over every factor map and recording all the values for all the interactions, a complete numerical profile for Cell A is established. By repeating the process for every cell in the study area, a complete numerical profile of Tippecanoe County was created.

The scoresheet was designed to record the complete set of values for a single square mile. FIGURE 11 is the completed scoresheet for a square mile located in the west central portion of our typical area, Fairfield Township. The scoresheet accommodates numerical data for the interaction between eight factors - listed down the left side - and five potential land use categories - abbreviated across the top and bottom - plus totals, for each of the thirty-six decision-making cells within a square mile.

For purposes of consistency, rules were established for scoring cells exhibiting multiple characteristics for any given factor, such as two or more SOIL PRODUCTIVITY ratings, multiple ACCESSIBILITY characteristics, and so on. Thus if a cell exhibited two characteristics of the same factor, the scorer recorded the numerical value associated with the predominant characteristic - if one occupied more land within the cell than the other - in the appropriate space on the scoresheet; if the division appeared equal, the higher

TOWNSHIP FAIRFIELD SECTION 14

T. 23 N.; R. 4 W.

URBANIZING ☑
RURAL ☐

NW¼

	R	A	I	C	O	R	A	I	C	O	R	A	I	C	O
SOIL PROD.	0	1	0	0	0	0	1	0	0	0	0	1	0	0	0
SOIL LIMITS.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FLOODPLAIN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FORESTED	1	0	-1	0	2	0	0	0	0	0	0	0	0	0	0
SAN. SEWER	0	0	-1	-1	0	0	0	-1	-1	0	0	0	-1	-1	0
ACCESSIBILITY	2	0	1	1	0	-1	0	0	0	1	2	0	1	1	0
R.R./AIRPORT	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0
CURRENT USE	0	2	0	0	0	-1	-1	-1	-1	2	2	0	0	0	0
TOTALS	**3**	**3**	**0**	**0**	**2**	**-2**	**0**	**-1**	**-2**	**3**	**4**	**1**	**0**	**0**	**0**
SOIL PROD.	0	1	0	0	0	0	1	0	0	0	0	1	0	0	0
SOIL LIMITS.	-1	0	-1	-1	0	-1	0	-1	-1	0	0	0	0	0	0
FLOODPLAIN	0	0	0	0	2	0	0	0	0	2	0	0	0	0	0
FORESTED	1	0	-1	0	2	1	0	-1	0	2	1	0	-1	0	2
SAN. SEWER	0	0	1	-1	0	0	0	-1	-1	0	0	0	-1	-1	0
ACCESSIBILITY	2	0	1	1	0	2	0	1	1	0	-1	0	0	0	1
R.R./AIRPORT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CURRENT USE	-1	-1	-1	-1	2	-1	-1	-1	-1	2	-1	-1	-1	-1	2
TOTALS	**1**	**0**	**-1**	**-2**	**6**	**1**	**0**	**-3**	**-2**	**6**	**-1**	**0**	**-3**	**-2**	**5**
SOIL PROD.	1	0	1	1	0	2	-1	2	2	0	2	-1	2	2	0
SOIL LIMITS.	0	0	0	0	0	-1	0	-1	-1	0	-1	0	-1	-1	0
FLOODPLAIN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
FORESTED	1	0	-1	0	2	1	0	-1	0	2	1	0	-1	0	2
SAN. SEWER	0	0	1	-1	0	0	0	1	-1	0	0	0	1	-1	0
ACCESSIBILITY	2	0	1	1	0	2	0	1	1	0	2	0	1	1	0
R.R./AIRPORT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CURRENT USE	-1	-1	-1	-1	2	-1	-1	-1	-1	2	-1	-1	-1	-1	2
TOTALS	**3**	**-1**	**1**	**0**	**4**	**3**	**-2**	**1**	**0**	**4**	**3**	**-2**	**1**	**0**	**6**

NE¼

	R	A	I	C	O	R	A	I	C	O	R	A	I	C	O
SOIL PROD.	0	1	0	0	0	0	1	0	0	0	0	1	0	0	0
SOIL LIMITS.	0	0	0	0	0	-1	0	-1	-1	0	0	0	0	0	0
FLOODPLAIN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FORESTED	0	0	0	0	0	1	0	-1	0	2	1	0	-1	0	2
SAN. SEWER	0	0	-1	-1	0	0	0	-1	-1	0	0	0	-1	-1	0
ACCESSIBILITY	2	0	1	1	0	2	0	1	1	0	2	0	1	1	0
R.R./AIRPORT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CURRENT USE	2	0	0	0	0	2	0	0	0	0	-1	-1	-1	-1	2
TOTALS	**4**	**1**	**0**	**0**	**0**	**4**	**1**	**-2**	**-1**	**2**	**2**	**0**	**-2**	**-1**	**4**
SOIL PROD.	0	1	0	0	0	0	1	0	0	0	0	1	0	0	0
SOIL LIMITS.	-1	0	-1	-1	0	-1	0	-1	-1	0	-1	0	-1	-1	0
FLOODPLAIN	0	0	0	0	2	0	0	0	0	2	0	0	0	0	2
FORESTED	0	0	0	0	0	0	0	0	0	0	1	0	-1	0	2
SAN. SEWER	0	0	1	-1	0	0	0	1	-1	0	0	0	1	-1	0
ACCESSIBILITY	2	0	1	1	0	2	0	1	1	0	2	0	1	1	0
R.R./AIRPORT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CURRENT USE	0	2	0	0	0	0	2	0	0	0	2	0	0	0	0
TOTALS	**1**	**3**	**1**	**-1**	**2**	**1**	**3**	**1**	**-1**	**2**	**4**	**1**	**0**	**-1**	**4**
SOIL PROD.	0	1	0	0	0	-1	2	-1	-1	0	0	1	0	0	0
SOIL LIMITS.	0	0	0	0	0	0	0	0	0	0	-1	0	-1	-1	0
FLOODPLAIN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
FORESTED	1	0	-1	0	2	0	0	0	0	0	0	0	0	0	0
SAN. SEWER	0	0	1	-1	0	0	0	1	-1	0	0	0	1	-1	0
ACCESSIBILITY	-1	0	0	0	1	2	0	1	1	0	2	0	1	1	0
R.R./AIRPORT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CURRENT USE	-1	-1	-1	-1	2	0	2	0	0	0	-1	-1	-1	-1	2
TOTALS	**-1**	**0**	**-1**	**-2**	**5**	**1**	**4**	**1**	**-1**	**0**	**0**	**0**	**0**	**-1**	**4**

SW¼

	R	A	I	C	O	R	A	I	C	O	R	A	I	C	O
SOIL PROD.	1	0	1	1	0	1	0	1	1	0	2	-1	2	2	0
SOIL LIMITS.	0	0	0	0	0	0	0	0	0	0	-1	0	-1	-1	0
FLOODPLAIN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FORESTED	0	0	0	0	0	1	0	-1	0	2	0	0	0	0	0
SAN. SEWER	2	-1	2	2	0	2	-1	2	2	0	2	-1	2	2	0
ACCESSIBILITY	2	0	1	1	0	2	0	1	1	0	2	0	1	1	0
R.R./AIRPORT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CURRENT USE	2	0	0	0	0	2	0	0	0	0	2	0	0	0	0
TOTALS	**7**	**-1**	**4**	**4**	**0**	**8**	**-1**	**3**	**4**	**2**	**7**	**-2**	**4**	**4**	**0**
SOIL PROD.	1	0	1	1	0	0	1	0	0	0	1	0	1	1	0
SOIL LIMITS.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FLOODPLAIN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FORESTED	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SAN. SEWER	2	-1	2	2	0	2	-1	2	2	0	2	-1	2	2	0
ACCESSIBILITY	2	0	1	1	0	2	0	1	1	0	2	0	1	1	0
R.R./AIRPORT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CURRENT USE	2	0	0	0	0	2	0	0	0	0	2	0	0	0	0
TOTALS	**7**	**-1**	**4**	**4**	**0**	**6**	**0**	**3**	**3**	**0**	**7**	**-1**	**4**	**4**	**0**
SOIL PROD.	1	0	1	1	0	0	1	0	0	0	-1	2	-1	-1	0
SOIL LIMITS.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FLOODPLAIN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FORESTED	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SAN. SEWER	2	-1	2	2	0	2	-1	2	2	0	2	-1	2	2	0
ACCESSIBILITY	2	0	1	1	0	2	0	1	1	0	2	0	1	1	0
R.R./AIRPORT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CURRENT USE	2	0	0	0	0	2	0	0	0	0	2	0	0	0	0
TOTALS	**7**	**-1**	**4**	**4**	**0**	**6**	**0**	**3**	**3**	**0**	**5**	**1**	**2**	**2**	**0**

SE¼

	R	A	I	C	O	R	A	I	C	O	R	A	I	C	O
SOIL PROD.	0	1	0	0	0	2	-1	2	2	0	0	1	0	0	0
SOIL LIMITS.	0	0	0	0	0	-1	0	-1	-1	0	-1	0	-1	-1	0
FLOODPLAIN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
FORESTED	0	0	0	0	0	1	0	-1	0	2	1	0	-1	0	2
SAN. SEWER	2	-1	2	2	0	0	0	1	-1	0	0	0	-1	-1	0
ACCESSIBILITY	-1	0	0	0	1	2	0	1	1	0	2	0	1	1	0
R.R./AIRPORT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CURRENT USE	-1	-1	-1	-1	2	-1	-1	-1	-1	2	-1	-1	-1	-1	2
TOTALS	**0**	**-1**	**1**	**1**	**3**	**3**	**-2**	**1**	**0**	**4**	**1**	**0**	**-3**	**-2**	**6**
SOIL PROD.	1	0	1	1	0	1	0	1	1	0	0	1	0	0	0
SOIL LIMITS.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FLOODPLAIN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FORESTED	0	0	0	0	0	1	0	-1	0	2	0	0	0	0	0
SAN. SEWER	0	0	1	1	0	0	0	1	1	0	0	0	-1	-1	0
ACCESSIBILITY	2	0	1	1	0	-1	0	0	0	1	2	0	1	1	0
R.R./AIRPORT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CURRENT USE	-1	-1	-1	-1	2	-1	-1	-1	-1	2	-1	-1	-1	-1	2
TOTALS	**2**	**-1**	**2**	**2**	**2**	**0**	**-1**	**-1**	**0**	**5**	**2**	**3**	**0**	**0**	**0**
SOIL PROD.	0	1	0	0	0	0	1	0	0	0	2	-1	2	2	0
SOIL LIMITS.	0	0	0	0	0	0	0	0	0	0	-1	0	-1	-1	0
FLOODPLAIN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FORESTED	0	0	0	0	0	0	0	0	0	0	1	0	-1	0	2
SAN. SEWER	2	-1	2	2	0	2	-1	2	2	0	0	0	1	1	0
ACCESSIBILITY	2	0	1	1	0	-1	0	0	0	1	1	0	-1	-1	0
R.R./AIRPORT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CURRENT USE	2	0	0	0	0	-1	-1	-1	-1	2	-1	-1	-1	-1	2
TOTALS	**6**	**0**	**3**	**3**	**0**	**0**	**-1**	**1**	**1**	**3**	**2**	**-2**	**-1**	**0**	**4**

of the two possible scores was recorded. For cells containing three characteristics of the same factor, the numerical value of the predominant characteristic was recorded where one characteristic predominated, while the middle value of the three possible scores was recorded if the three-way division appeared equal.

The single exception to the scoring rules involves the RAILROADS AND AIRPORTS factor, which was scored by averaging values for the two characteristics, and rounding off to the higher whole number when positive, or to -1 when negative. Thus RESIDENTIAL potential for a cell located more than 300' from a railroad, but within proximity of an airport, was scored as $\frac{0 + (-1)}{2} = -1/2 = -1$. A cell adjacent to a railroad line and proximate to an airport would have a recorded value for INDUSTRIAL potential of $\frac{2 + 1}{2} = 1\frac{1}{2} = 2$.

With scores recorded for each land use category in every cell in the study area, individual cell totals were obtained. To make all these numbers useful and easily interpretable they had to be made comparable across land use category lines and relative within each land use category. A glance at the model will show the need for a cross-category comparability adjustment: the highest possible AGRICULTURAL potential score is four points, while the highest possible RESIDENTIAL score is eleven points. Furthermore the former was often achieved, and the latter never. The very highest scores were never reached in the INDUSTRIAL, COMMERCIAL and OPEN SPACE categories either. Note the range of totalled scores within the square mile scoresheet shown in FIGURE 11: RESIDENTIAL, -1 to +8; AGRICULTURAL, -1 to +4; INDUSTRIAL, -3 to +4, COMMERCIAL, -2 to +4; and OPEN SPACE, 0 to +6.

We accomplished the tasks of making the numbers internally relative and externally comparable by dividing the interval of achieved scores from zero on up, for each land use category, into four quarter intervals. We assigned a relative potential designation and the appropriate numerical values to each quarter interval as follows:

RELATIVE LAND USE POTENTIALS
QUARTER INTERVALS

QI	RELATIVE POTENTIAL	RESI-DENTIAL	AGRICUL-TURAL	INDUS-TRIAL	COMMER-CIAL	OPEN SPACE
4	HIGHEST	6+	4	6+	5+	6+
3	HIGH	4-5	2-3	4-5	4	4-5
2	LIMITED	2-3	1	2-3	2-3	2-3
1	LOW	0-1	0	0-1	0-1	0-1

Scores below zero were taken as an indication of incompatibility between a given land use category and the characteristics exhibited by a given cell.

Having generated raw scores, and having made those scores comparable and relative, we were then able to assemble the actual product of the study: five graphics, each one representing the relative potential for use in each of the five use categories for every cell in the study area.

The corresponding relative use potentials maps for our typical area in Fairfield Township are reproduced in FIGURES 12 through 16. Overall, these graphics indicate a non-expansive development potential within this area.

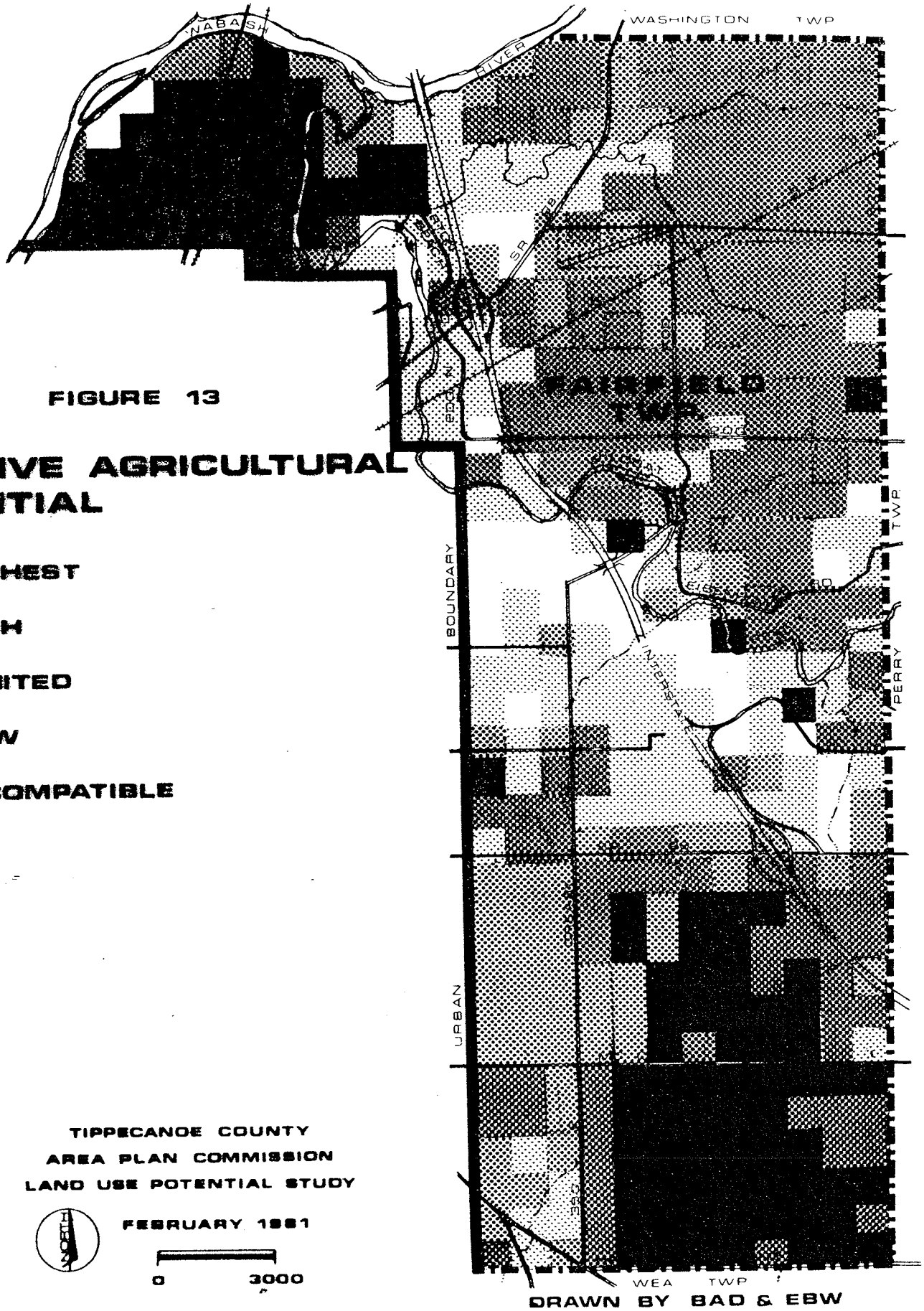

FIGURE 13

RELATIVE AGRICULTURAL POTENTIAL

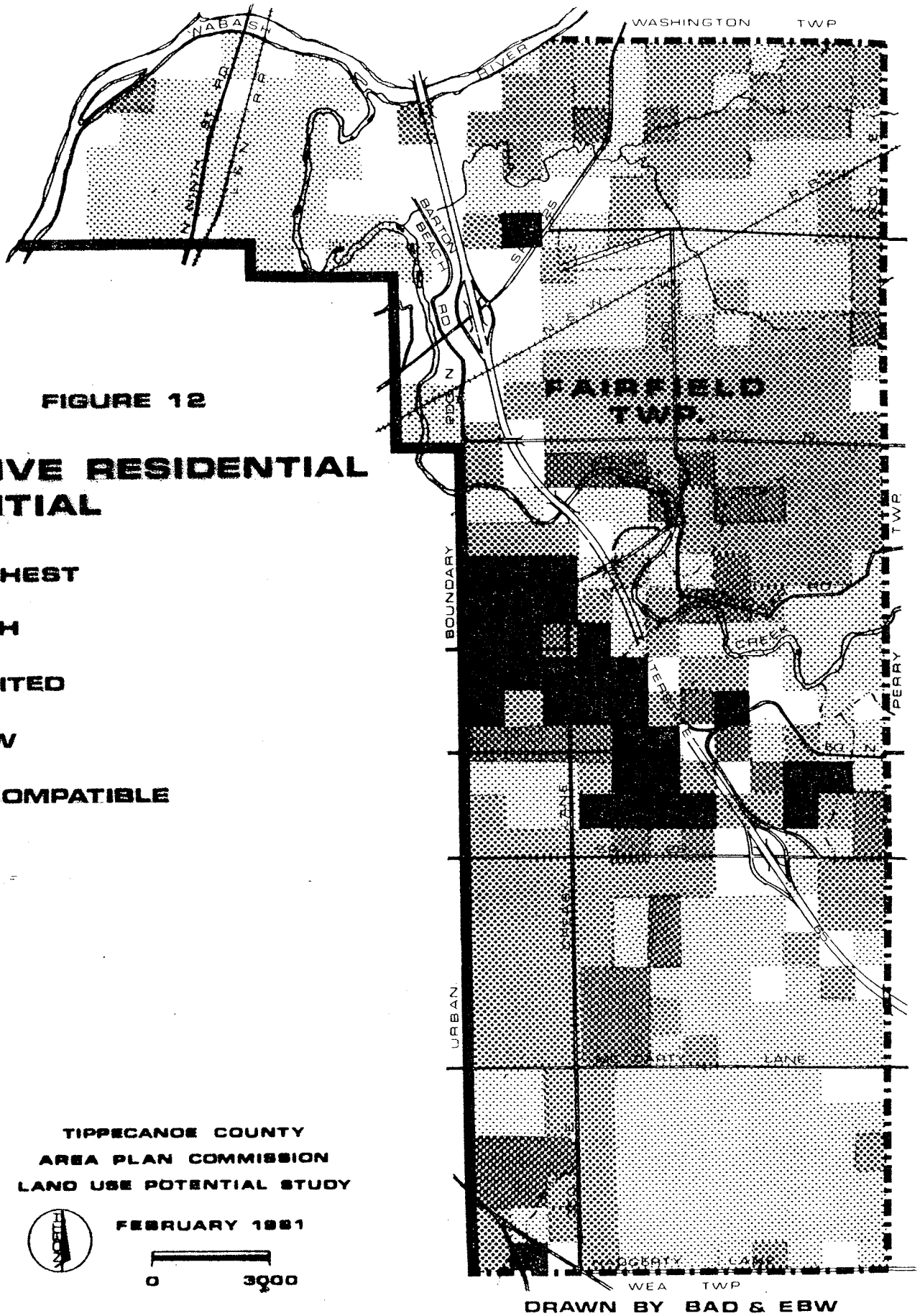

FIGURE 12

RELATIVE RESIDENTIAL POTENTIAL

- HIGHEST
- HIGH
- LIMITED
- LOW
- INCOMPATIBLE

TIPPECANOE COUNTY
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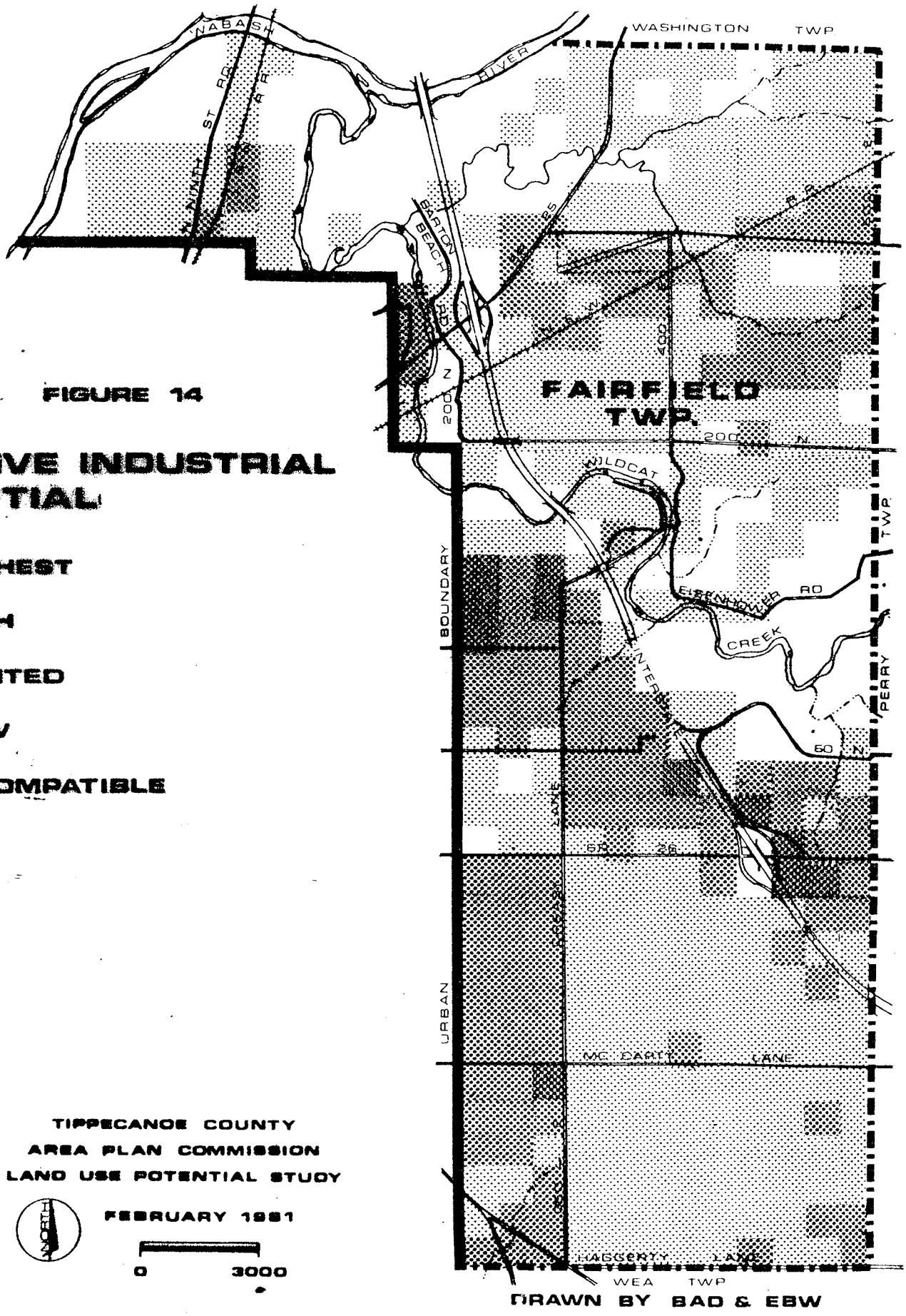

FIGURE 14

RELATIVE INDUSTRIAL POTENTIAL

- HIGHEST
- HIGH
- LIMITED
- LOW
- INCOMPATIBLE

TIPPECANOE COUNTY
AREA PLAN COMMISSION
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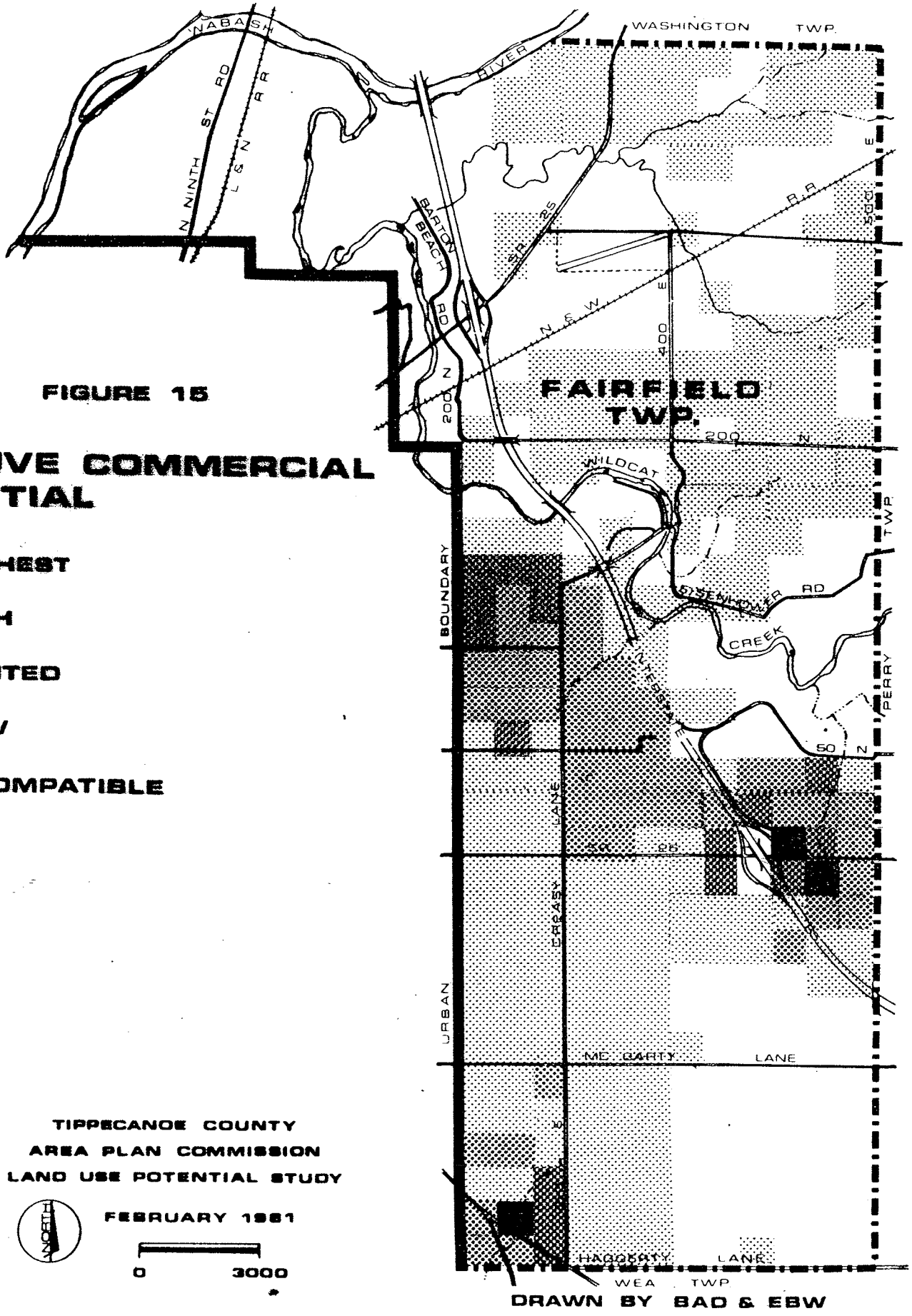

FIGURE 15

RELATIVE COMMERCIAL POTENTIAL

- HIGHEST
- HIGH
- LIMITED
- LOW
- INCOMPATIBLE

TIPPECANOE COUNTY
AREA PLAN COMMISSION
LAND USE POTENTIAL STUDY

FEBRUARY 1981

NORTH

0 3000

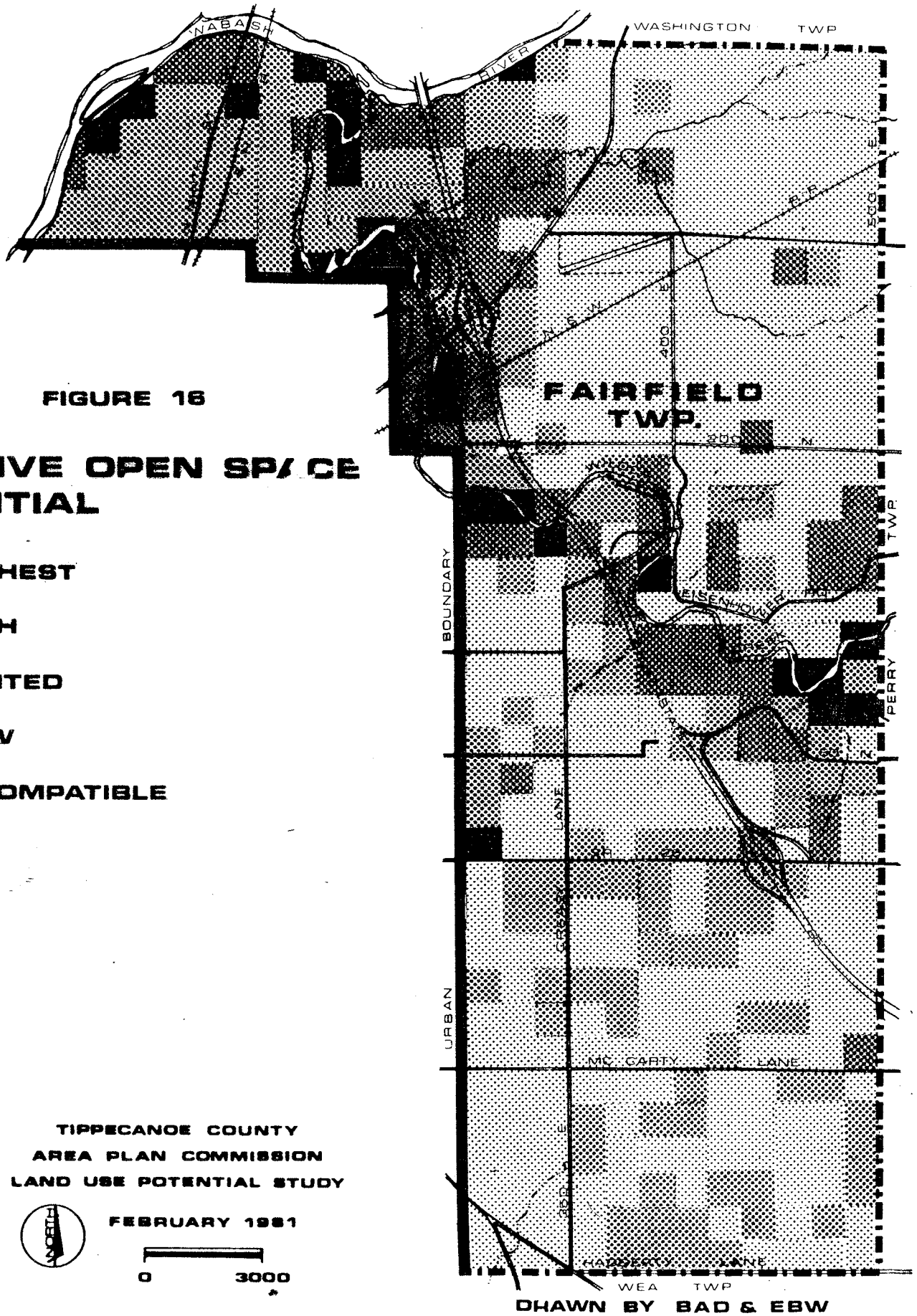

FIGURE 16

RELATIVE OPEN SPACE POTENTIAL

- HIGHEST
- HIGH
- LIMITED
- LOW
- INCOMPATIBLE

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RESIDENTIAL potential within the high/highest range - quarter intervals 3 and 4 - is by-and-large limited to areas of current and expected residential use. Despite current and expected industrial use along the southwestern edge, INDUSTRIAL potential rarely rises above the low/limited range - quarter intervals 1 and 2. These model-generated limits can easily be traced back to SOIL PRODUCTIVITY and SOIL LIMITATIONS factors (see FIGURES 3 and 4): the southernmost one-third of this portion of Fairfield Township contains soils that with few exceptions are very highly productive for growing crops, and which have severe limitations for construction of all kinds. The northwest corner of the township can be similarly characterized; however these lands lie in the flood plain of the Wabash River, and are thus precluded from development.

Not surprisingly, AGRICULTURAL potential ranges from high to highest virtually throughout the portion of Fairfield Township depicted, broken only by the nearly solid RESIDENTIAL pattern of the west central sector, and some non-productive soils along the steeply sloped sides of the Wildcat Creek valley. That valley, of course, exhibits third and fourth quarter interval scores for OPEN SPACE potential.

To complete the data analysis, one additional graphic was created: a combined high/highest land use potentials map, which summarizes the data generated by the study. Information is given indicating all third and fourth quarter interval use potentials for every cell in the study area. Many cells are shown as having multiple use potentials; only a few percent of all cells in the study area exhibit less than high potential for some use within the five potential use categories. Because of its graphic complexity, a reproducible version of this map has not been created for this manual.

E. Land Use Plan Development

With an extensive data base in hand - in the form of land use potentials maps, backed up by factor maps - the actual land use plan can then be developed. It should be noted that the particular proposed plan that has been generated need not be considered as "cast in concrete." Because a decision-making model has been used to analyze multiple factors, and because this manual makes the methodology of the study explicit and replicable, the resulting land use plan can easily be made subject to revision as factors change. Thus the construction or extension of a sanitary sewer line can and should be accompanied by an adjustment to the land use plan; new scores can be recorded by applying the same decision-making model to an updated factor map. Changes in current land use and the highway network can be similarly accounted for. Updated soils information - expected in the next few years - can be plugged into the model as well. Because the same methodology can and will be used to reevaluate situations as they change, this technical manual, and its essential element - the decision-making model - are being made a part of the forthcoming Comprehensive Plan for Tippecanoe County, in addition to the specific plan that it has generated.

A very brief description of the processes used to get from data base to plan follows. A complete description of that proposed plan, including an implementation strategy for its effectuation, will be made available prior to the series of public hearings on the Comprehensive Plan to be held in June, 1981.

TASK 13 - GENERATE A "FIRST CUT LAND USE PLAN" TO VISUALLY DESCRIBE THE ULTIMATE USE POTENTIAL THROUGHOUT THE STUDY AREA;

TASK 14 - USING THE OUTPUT OF THE RESIDENTIAL LAND USE POTENTIALS STUDY, PARE DOWN THE THEORETICAL FIRST CUT PLAN INTO A PHASED PROPOSAL.

The FIRST CUT LAND USE PLAN represents a sifting out of use potentials in a simplified non-gridded format. The resulting graphic looks precisely like an expanded version of the CURRENT AND EXPECTED LAND USE factor map (FIGURE 10) and is thus directly comparable to it. What is depicted in a FIRST CUT PLAN is a generalized version of the theoretical situation in which all land in the study area is used to its best potential as determined by the foregoing methodology.

In translating cell-by-cell use potentials into a FIRST CUT PLAN, two kinds of problems needed to be solved: how to treat areas exhibiting multi-use potentials, and how to deal with relatively small areas of AGRICULTURAL potential surrounded by areas with development potential.

Solutions to the first problem varied by location. Thus in those cells exhibiting third and fourth quarter interval development potentials for more than one use, one of which had already been developed, that current use prevailed. Such was the case for that portion of Fairfield Township represented on the sample scoresheet (FIGURE 11); the reader's attention is drawn to the scores for cells in the southwest quarter of that square mile. Largely because of location within the manmade infrastructure and a lack of soil limitations, these cells exhibit third and fourth quarter interval potentials for RESIDENTIAL, INDUSTRIAL and COMMERCIAL use.

In fact, this land has already been developed residentially, and is so depicted on the FIRST CUT LAND USE PLAN (FIGURE 17, west central, adjacent to the word, "boundary").

In undeveloped sectors of the study area, fourth quarter interval AGRICULTURAL potential prevailed over other use potentials in cells exhibiting multi-use potentials. In general, any fourth quarter interval potential prevailed over any third quarter interval potential within any multi-use cell. However it must be noted that area-wide patterns were permitted to prevail over single dissimilar or aberrant cells. Also, "ties" between two potential uses were broken by reinforcing those factors used by the decision-making model. Thus undeveloped lands having equally high potential for RESIDENTIAL and INDUSTRIAL use were assigned to the latter category when located near a major highway and/or railroad right-of-way, and to the former category when located further from those facilities.

The second problem - tracts of land with AGRICULTURAL potential surrounded by land with development potential - was solved by making a pragmatic economics-based decision. Market pressure to develop these farmlands could not likely be withstood, and so the FIRST CUT PLAN shows these tracts to be developed rather than farmed. However, nearly all the farmland "lost" through this decision had third quarter interval potential and not fourth.

An additional point about the translation of potential use graphics into a FIRST CUT PLAN: land exhibiting no high/highest potential at all - that is no more than first or second quarter interval potential for any and all uses - was kept in its current use. Thus despite current industrial use, the half-square mile seen in FIGURE 17 at the western border adjacent to the word "urban," exhibited only

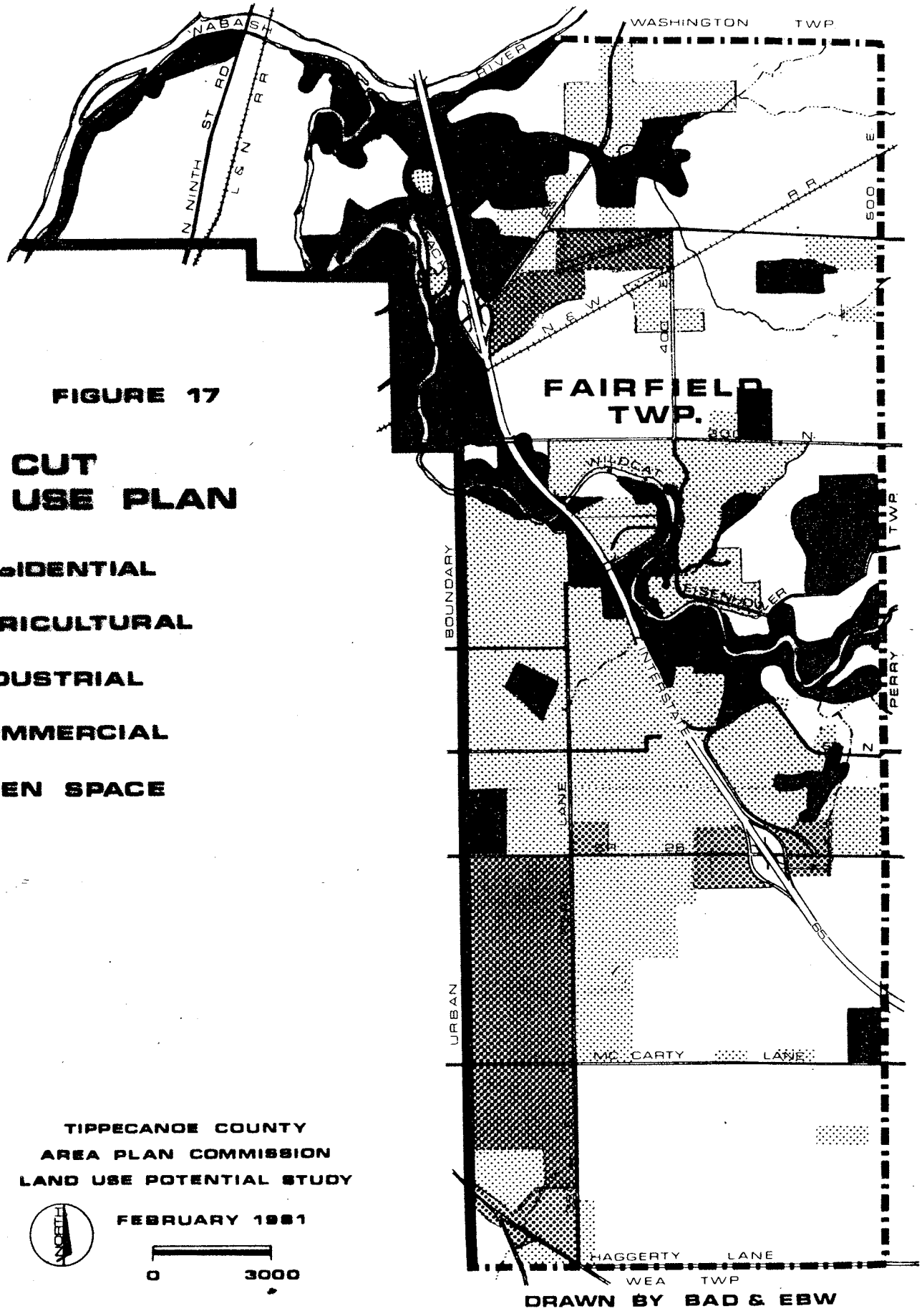

FIGURE 17

FIRST CUT LAND USE PLAN

- RESIDENTIAL
- AGRICULTURAL
- INDUSTRIAL
- COMMERCIAL
- OPEN SPACE

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limited potential for that use category, largely because of the presence of very productive and very poorly drained soils. (Indeed the developers of that site spent considerable amounts of money stripping away their "problem" soils and laying down a buildable surface on which to construct their plant.)

Countywide, the decision-making model has provided for an abundance of developable land far beyond the long-range needs of the community, without significantly subtracting from the supply of prime agricultural farmland. Yet, as previously noted, the ultimate FIRST CUT LAND USE pattern for the portion of Fairfield Township depicted in FIGURE 17 does not differ markedly from CURRENT AND EXPECTED USE, as seen in FIGURE 10. Soils to the south, northwest and northeast range from highly to very highly productive, and soil limitations tend to be severe. Additionally, a lack of sanitary sewer plus the presence of railroad right-of-way and an airport, restrict RESIDENTIAL use potential severely. The FIRST CUT PLAN similarly holds the line on industrial expansion, again largely because of soil characteristics. Some expansion of highway-related business use has been projected by the decision-making model. Residential expansion is largely limited to an infilling of the current pattern, with additional potential north of Wildcat Creek.

Simultaneous with the development of this land use potentials methodology, a system for expanding on residential land use potentials was being formulated. The residential use study shares much of its data base with the land use potentials study, and is procedurally almost identical. Indeed the portions of the county to which the technique is applied are precisely those areas within the URBANIZING

sector which have been designated as having high or highest RESIDENTIAL land use potential, but which are as yet undeveloped.

The theoretical framework for the residential use methodology is an amalgam of decision-making modeling technique and elements typical of performance standard zoning, known for its flexibility and emphasis on site-specific design. What has been adapted from this kind of approach is a reliance on measures of land use intensity, most notably density and impervious surface ratio. Density is simply a measure of the number of dwelling units per gross acre, with no emphasis on lot size. Impervious surface ratio is a measure of the amount of land surface area per acre that does not absorb rain. The impervious surface includes buildings, parking areas, driveways, sidewalks, and any other areas covered with concrete or asphalt. High density does not necessarily imply a high impervious surface ratio. This system, then, uses decision-making models based on physical and locational characteristics to generage maximum allowable densities and impervious surface ratios for as-yet undeveloped land exhibiting strong potential for future residential use. (A technical manual describing these procedures will be made available at a later date.)

Even excluding vast amounts of land with strong RESIDENTIAL potential lying beyond the URBANIZING sector (see FIGURE 2), the RESIDENTIAL potentials study indicated sufficient capacity to double the current housing stock of the entire county. Because county population is growing at less than one percent per year, the FIRST CUT PLAN had to be pared down beyond just excluding all potential development beyond the URBANIZING boundary.

Using data generated by the residential potentials methodology, residential expansion areas within the urbanizing sector were classified as follows:

- -Close-in parcels, contiguous to current development, capable of being served by current or minimally expanded sanitary sewer systems;
- -Areas slightly beyond contiguous development, which would require more than minimal additions to be served by sanitary sewer; and
- -Land not at all likely to be served by sanitary sewer in the foreseeable future.

The close-in classification contained over 3,000 acres of as-yet undeveloped land having good RESIDENTIAL potential. Our data indicated a realistic - not maximum - potential for some 12,000 new housing units to be built on that land. In our PHASED LAND USE PLAN proposal, these 3,000 acres are designated as PHASE I. At current growth rates, PHASE I residential land should be sufficient to meet population growth well into the next century.

In the event of significant changes in the local economy leading to much more rapid population growth - and additionally, so as to not severely limit the availability of residentially developable land - land classified in the second category has been designated for PHASE II residential expansion. At such time as the remaining amount of PHASE I land drops below 1,500 acres, PHASE II - with its additional 1,400 acres - would be automatically triggered. Lands with RESIDENTIAL potential designated as being beyond the reasonable reach of sanitary sewer expansion have been excluded from the residential category, and are intended to remain in agricultural use.

With regard to industrial expansion, all lands with INDUSTRIAL potential indicated in the FIRST CUT PLAN were designated as PHASE I if located within the URBANIZING sector, or PHASE II if beyond. The phased proposal also distinguishes between AGRICULTURAL and SELECT AGRICULTURAL lands, the latter category corresponding to fourth quarter interval AGRICULTURAL potential. This distinction will become part of forthcoming strategies to prevent non-agricultural use of the county's best farmland and to limit non-agricultural use in the next-best category.

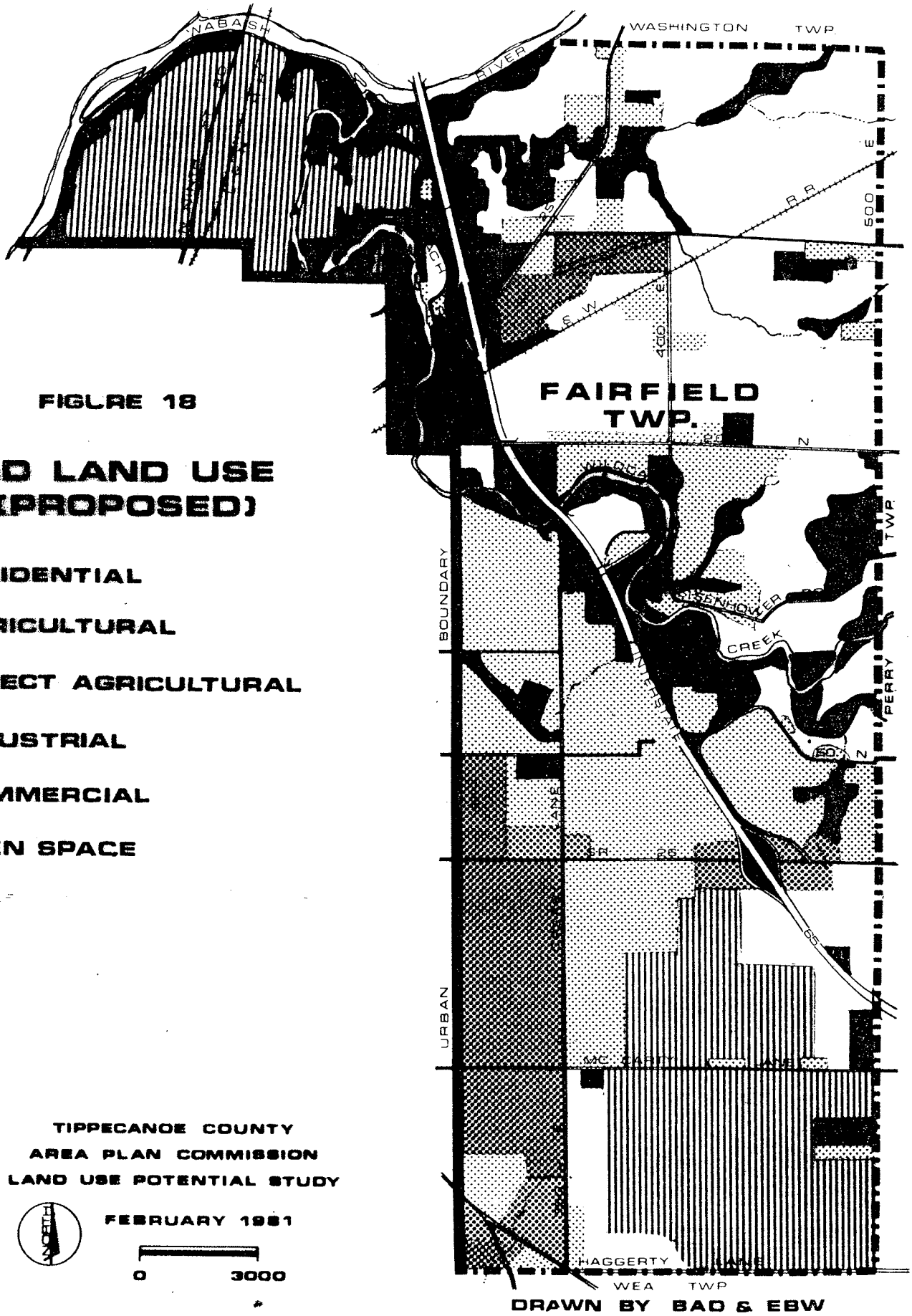
Because of locational factors, all residential expansion within Fairfield Township indicated in the FIRST CUT LAND USE PLAN (FIGURE 17), has been carried over into the PHASED LAND USE PLAN proposal (FIGURE 18) and designated as PHASE I. The extent of this expansion is somewhat more than 400 acres capable of supporting over 1,000 new dwelling units. Because the resulting graphic would have been too complex to reproduce well, FIGURE 18 - unlike the presentation map from which it has been adapted - makes no distinction between CURRENT AND EXPECTED USE and proposed PHASE I development. The reader is asked to compare FIGURES 18 and 10 to deduce PHASE I development areas. There is no PHASE II development land within this portion of Fairfield Township. Also notice those portions designated SELECT AGRICULTURAL; please compare with FIGURE 13, RELATIVE AGRICULTURAL POTENTIAL.

The PHASED LAND USE PLAN proposal, along with a corresponding urban area land use plan proposal, and several additional Comprehensive Plan components, will be the subject of a series of public hearings scheduled for June 1981. The subsequent adoption process - first by the Tippecanoe County Area Plan Commission and then by its five member governments - is likely to be complete by the end of the year.

FIGLRE 18

PHASED LAND USE PLAN (PROPOSED)

- RESIDENTIAL
- AGRICULTURAL
- SELECT AGRICULTURAL
- INDUSTRIAL
- COMMERCIAL
- OPEN SPACE



TIPPECANOE COUNTY
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DRAWN BY BAD & EBW

E. EVOLUTION OF THE METHODOLOGY

During the early days of this project seven memoranda were written, first to the staff and later to a newly established Land Use Study File, describing the conception and gestation of the land use potentials study. These memoranda - complete with frequently revised versions of the decision-making model - trace the development of the program throughout the Pilot Study, conducted on Wea Township within Tippecanoe County.

Inclusion of this diary should be helpful in a number of ways: it clearly points out the need to take the time to pretest the system; it just as clearly emphasizes the need to be - and to remain - flexible through a series of changes; and hopefully it will prevent some other planning staff from repeating some of our mistakes.

Because the Toledo-Lucas County planning staff took time to describe their work, we were able to do ours. We feel our work to be a significant contribution to the field of land use planning. We hope this volume will assist others in their efforts to plan for their own communities.

tippecanoe county area plan commission

20 north 3rd, lafayette, indiana
(317) 423-7575 47901
terry l. virta, executive director

TO: Terry L. Virta, Executive Director
FROM: Bernard Gulker, Senior Planner
SUBJECT: Land Use Study Proposal
DATE: June 28, 1978
REF. NO.: 411-78

I have been studying the Toledo-Lucas County Plan Commission's Land Use Allocation System: A Pilot Study, and I am convinced that the basic methodology is applicable to our own efforts to devise a land use plan for Tippecanoe County. The system assigns land uses to a parcel on the basis of that parcel's suitability, or capability, or potential to support that use better than any competing use.

The system is touted as being rational, inductive and quantitative rather than intuitive, deductive and qualitative. This has advantages: one needn't fall back on "good planning principles" as the answer to the question, "why?"; citizens and officials can be given the opportunity to input into the decision-making model; factors of resource management can be blended with economic realities; suitability is determined independent of demand, etc. Basically, we're talking about an all-cards-on-the-table, easily justifiable, the-numbers-decide-for-you system. It looks like a lot of work, but I think the end product is very clean.

The system works roughly like this:

1. A suitability matrix is established. This is the decision-maker in the system; once these groundrules have been established, just about all the rest can be done by technicians. This matrix is a chart with factors influencing land use listed down the left side - soils, slope, current use, accessibility, utilities, etc. - and land use categories listed across the top - residential, agriculture, etc. At the point where each land use category intersects each factor a decision must be made as to what aspects of that factor (if any) are either preferable, acceptable or not acceptable to the occurance of that land use, with either 2 or 1 or 0 points awarded accordingly. (See - there are other number freaks out there!) Also a hierarchy of land uses must be established to be applied in the event of numerical ties.

2. Data is assembled and mapped. The information pertinent to each factor used in the matrix must be gathered and graphically portrayed, individually, or uniform-scale maps.

3. Data is scored and aggregated. The area being studied is divided into a fairly fine grid and each cell is then scored for each land use category based on the points awarded per factor in the suitability matrix, discussed above. The land use with the highest score is then assigned to that particular cell. The land uses within these cells are then aggregated into a somewhat larger area (usually defined by the road network or natural barriers), thus producing a generalized land use suitability map. Voila!

4. The suitability map may be modified if needed. Thus if a needs assessment study is available the suitability map may be tested against it to make sure sufficient land for each land use has been provided. If not an adjustment could be made by designating land for a given use which has been judged to be less than ideally suited.

Land use suitability or potential would seem to lend itself well to the real problem area of land use planning - the urbanizing suburban fringe, where the conflicts are real and the battlefield always shifting. Those areas that are more static - established urban areas where current land use will persist, and rural areas where fewer development pressures exist - should not require the same minute examination as the urbanizing sections. I would propose then that the land use plan be a coalescing of three distinct planning efforts reflecting the nature of the areas involved:

- Because land uses in the urban areas will largely persist, fewer decision need be made; an inductive, quantifiable system for making decisions would be wasteful. A more traditional, intuitive, block-by-block examination (as was done for the Sketch Plan) seems in order. Perhaps the suitability matrix can be applied to the larger undeveloped, underdeveloped, or deteriorating tracts within the cities.

- The urbanizing areas surrounding the cities must be examined closely for land use suitability. I would suggest creating a grid of 880-foot squares, each 17.78 acres. Thus a decision can be made six times per each linear mile, 36 times per square mile. This would fit our section mapping system better than the 800-foot square cells used in the LUAS Pilot Study.

- Because of fewer development pressures in the clearly rural areas, fewer land use suitability decisions need to be made.

I would suggest using the suitability matrix but establishing a much broader grid, perhaps half-mile squares, with four to the square mile.

Much as the LUAS was tested on an urbanizing Lucas County, Ohio township, I propose we test our system on the analogous area in our county, Wea Township. I suggest we devise the matrix for the test in-house, run through the entire process of data collection, scoring and modification, and then present the resulting (partial) land use plan to whomever you would like to involve in the decision-making process (Commissioners, CPC, etc.) for general approval of the procedure and whatever modifications of the suitability matrix that they may suggest and we agree to. Assuming the Wea test is a success and well received, we can proceed from there.

With your approval, what I need is a Staff bull session, to include all seven planners and Diane, to work up the following:

1. designating of the boundaries demarking the urban, urbanizing and rural sectors of the county;

2. formulation of the suitability matrix. We will need to discuss factors, starting with the LUAS list, in terms of relevance, data availability, format, etc.; land use categories to be used; a scoring system; and, most important the nature of the interactions between factors and land use categories;

3. hierarchy of land use categories to be used to mediate tie scores;

4. determination of cell size for mapping decision-making data, both for the urbanizing and the rural sections; and

5. establishment of a work program, vis-a-vis who will perform which tasks when.

I think such a session would require at least ½-day of Staff time, perhaps as much as a full day. In order to cut the time to a minimum, I would have each Staff member read the LUAS report a day or two prior to the session, and be briefed as to what the session would be about. The LUAS report can be read in about an hour. As always, plumbing the depths of Staff's knowledge and experience can only have a positive effect on the quality of the project.

Let me know how you feel about all this. If you'd like to pursue this methodology, I'm ready to go; the next step would be the Staff session.

BG/ja

tippecanoe county area plan commission

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(317) 423-7575 47901
terry l. virta, executive director

MEMORANDUM

TO: Professional/Technical Staff
FROM: Bernard Gulker, Senior Planner
SUBJECT: Land Use Study
DATE: July 6, 1978
REF.NO.: 434-78

Again thanks for your time and your input at last week's staff session. The purpose of this memo is simply to review the decisions made at that time. If I've forgotten or misinterpreted anything please let me know. The following was resolved:

1. The County was divided into three development categories - urban, urbanizing and rural - to receive differing treatment in the land use study. The attached map indicates the boundaries agreed to at the meeting. Note that the urbanizing area includes six satellites: Stockwell, Clarks Hill, West Point, Romney, the east end of Otterbein, and the developing area at the northeast, adjacent to Delphi. It was decided to treat the urban area in the traditional, "intuitive" fashion of land use planning, while applying the land use potentials matrix to the urbanizing area (with 36 decisions per square mile) and the rural area (16 decisions per square mile).

2. A decision-making model was produced - the attached Tentative Land Use Potentials Matrix - that encompasses five land use categories, nine determining factors, and four values roughly equivalent to "preferable," "acceptable," neutral or inapplicable, and "usually unacceptable." Included with the factors are the expected data sources. The Soil Developability factor is as yet undefined and unscored.

3. Staff decided to eliminate one source of potential bias from the model by not establishing a hierarchy of use categories to break scoring ties - as had been done in Toledo-Lucas County - but rather to allow the predominating land use in contiguous cells to function as a tie-breaker.

4. In order to preserve a realistic picture of ongoing development, staff agreed to include in the current use factor all projects now in the drawing-board stage, such as platted (prelim. or final) but as yet unbuilt subdivisions, the anticipated Catepillar operation, etc.

5. All mapping will be done at a 1"=3000' scale to generate comparable and easily scored results at a size permitting ease of mapping as well as sufficient accuracy. County soil survey maps, at 1"=½ mile are to be photographed to a 1"=3000' scale.

6. Staff concurred that Wea Township would provide the best testing ground for the entire methodology. A pilot study- to test the feasibility of the project in general, and the accuracy of the decision-making model specifically- will be performed on those 36 square miles (except for a small portion at the north end defined as "urban") at 36 cells to the square mile. Except for sanitary sewer information, to be obtained from the City Engineers, all data is available in house. As such, we have decided to assemble data and map the factors for Wea Township only, except for the sewers information which will be gathered once only, county-wide.

TIPPECANOE COUNTY, INDIANA

TIPPECANOE COUNTY HIGHWAY MAP

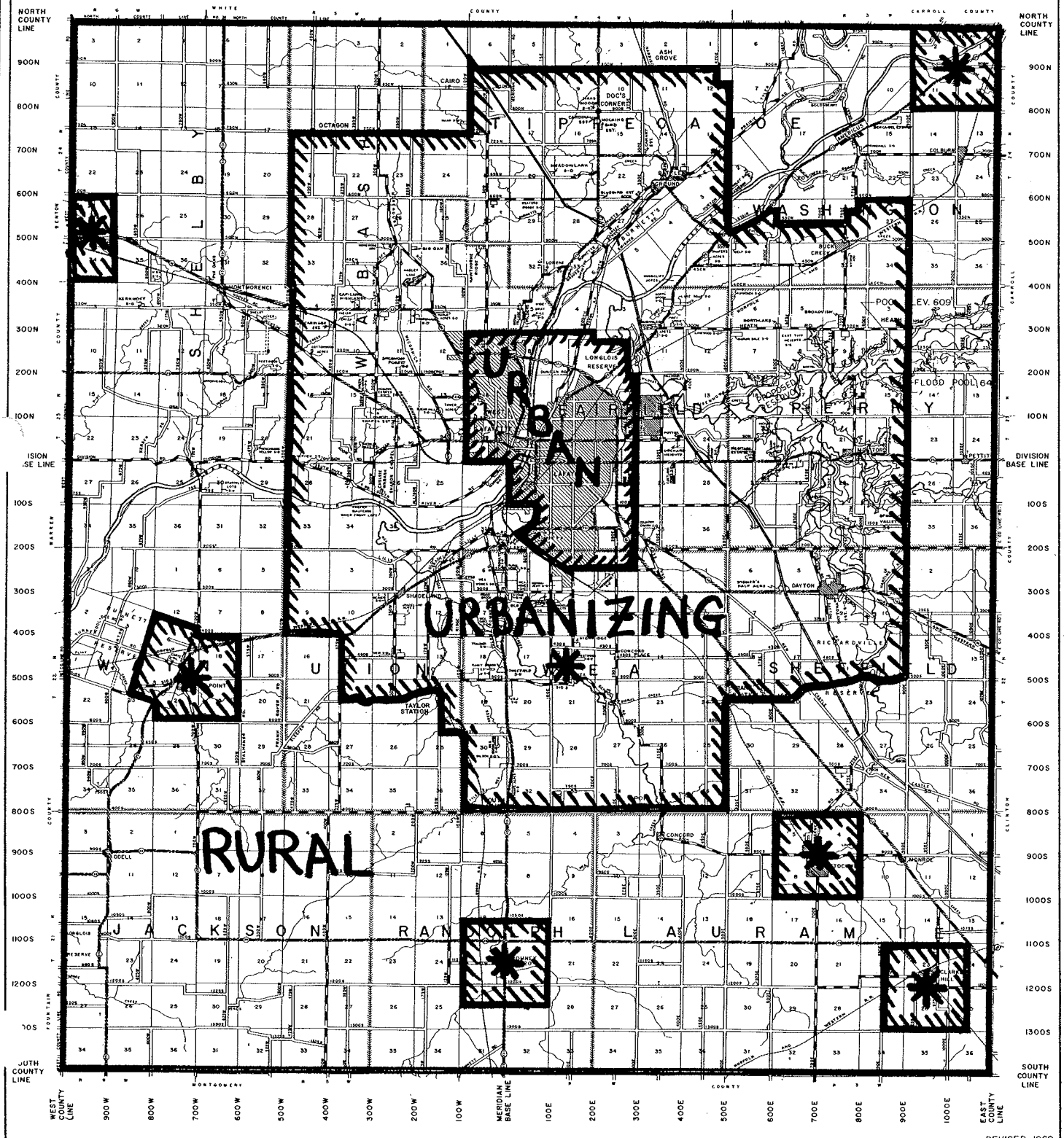
LEGEND
- INTERSTATE ROADS
- STATE AND FEDERAL ROADS
- COUNTY ROADS
- RAILROADS
- TOWNSHIP LINES
- RURAL SCHOOLS
- CEMETERIES

FROM A BASE MAP BY
ARTHUR F. BUERKLE, TIPPECANOE COUNTY SURVEYOR
REVISED 1960

BOARD OF COUNTY COMMISSIONERS
FLOYD GINGRICH
DALE REMALY
BRUCE OSBORN
COUNTY HIGHWAY ENGINEER
BRIAN DICKERSON
COUNTY HIGHWAY SUPERVISOR
WM. STOVALL SR.

N

SCALE IN MILES



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TENTATIVE LAND USE POTENTIALS MATRIX

LAND USE → / ↓ FACTOR — VALUE →	RESIDENTIAL				AGRICULTURE				INDUSTRY				COMMERCIAL				OPEN SPACE			
	2	1	0	-1	2	1	0	-1	2	1	0	-1	2	1	0	-1	2	1	0	-1
SOIL PRODUCTIVITY - SOIL SURVEY PP. 100-117	Lo	Mod	Hi	VHi	VHi	Hi	Mod	Lo	Lo	Mod	Hi	VHi	Lo	Mod	Hi	VHi			All	
SOIL DEVELOPABILITY																				
SLOPE % - SOIL SURVEY	0-8	8-12	12+		0-3	3-8	8-12	12+	0-3	3-8		8+	03	3-8		8+	All			
FLOODPLAIN - HUD MAPS + SOIL SURVEY			Prone	Plain	Prone	Plain					Prone	Plain			Prone	Plain	Plain	Prone		
FORESTED - AERIAL PHOTOS		Yes					Yes					Yes			Yes		Yes			
SANITARY SEWER - CITY ENGINEERS [% distance between frontages]	Present 1000'							Present 1000'	Present 1000'	Nearby 1000'-1 mi.		1 mi.+	Present 1000'	Nearby 1000'-½ mi.		½ mi.+			All	
ACCESSIBILITY - HIGHWAY ENGINEER	Other Paved	Unpaved		SR+		Paved	Unpaved		SR+	Other Paved		Unpaved	SR+	Other Paved		Unpaved			All	
RAILROADS / AIRPORTS - APC MAPS			300'+	0-300' NSUA			ALL NSUA		0-300'	300'-½mi	½ mi+ NSUA				300'+	0-300' NSUA		0-300'	300'+ NSUA	
CURRENT USE - APC SURVEY (1977) PLUS "WHAT'S ON THE DRAWING BD."	Res.			AG-Hi/VHi OS	AG			OS	IND			AG-Hi/VHi OS	Comm.			AG-Hi/VHi OS	OS			AG-Hi/VHi

tippecanoe county area plan commission

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terry l. virta, executive director

MEMORANDUM

TO: Professional/Technical Staff
FROM: Bernard Gulker, Senior Planner
SUBJECT: Land Use Study
DATE: July 18, 1978
REF.NO.: 446-78

Just an update on the status of the various activities involved: the land use potentials matrix and the collection, analysis and mapping of data. A revised matrix is attached.

The revised matrix has been, hopefully, completed. Two factors appearing on the previously distributed matrix - soil developability and slope - have been collapsed into a single factor - soil limitations - in order to correspond to the soil survey intrepretation data provided us by Bill Martin at the SCS. Soil limitations for residential use are based on the category "dwellings without basements;" soil limitations for industrial and commercial uses - impossible to separate given the available data-come from the "small commercial buildings" category, which is sufficiently broad in definition to be useful. Open space soil limitations will be based on a combined rating for the four recreational categories displayed on the interpretation sheets - camping, picnicking, playgrounds, paths and trails, - with tie-breaking in the direction of decreasing severity. Also, any rating solely resulting from the limitation "floods" will be decreased one level in severity as per our discussions on the nature of open space. Soil limitations for agricultural use will simply be an average of the productivity rating and slope as shown in the matrix.

The floodplain factor has been revised: the flood prone/ floodplain distinction could not be made with available data, and thus the flood prone designation has been dropped. Additionally, "flooding soils" is now the determinant, as per the information available in the soil interpretation sheets. In determining the potential for agricultural land use, a two-way distinction is made between alluvial and organic soils, which have flooding characteristics or frequencies making them somewhat less desirable for agricultural usage, and all other soils characterized as having flooding tendencies.

The only other change in the matrix involves the railroads/ airports factor. With regard to airports, what had been NSUA (Noise Sensitive Use Area) is now simply "proximity," which is defined as including the areas 3000 ft. off the ends of runways plus the 2000 ft. ring around the airport boundaries

(yellow area and green rings on Jim's map). Score industrial land use + 1 if it has airport proximity, AG and OS score 0, RES and COMM., -1.

Work on the factors is progressing as follows:

-Soil Productivity - now being mapped;
-Soil Limitations - data has been gathered and is now being analyzed prior to mapping;
-Floodplain-data is ready for mapping;
-Forested - mapping completed;
-Sanitary Sewer - data still needs to be gathered;
-Accessibility - data has been collected, but must be confirmed with vacationing County Highway Supervisor prior to mapping;
-Railroads/Airports - now being mapped; and
-Current Use - data will require significant analysis prior to mapping.

Terry and I have discussed an additional level of analysis, beyond the generalized land use map that will show the competitively determined land use having the highest potential for a given parcel. Specifically, the scored data will also generate relative potentials for each separate land use; thus there would be five additional maps, one for each land use category, each map showing a range of potentials from preferable to acceptable to not acceptable for its specific land use category. I'd like your comments on this additional analysis - (Diane: Hush!) - or any other part of the study, including these revisions. Thanks.

REVISED LAND USE POTENTIALS MATRIX

↓FACTOR / LAND USE → VALUE →	RESIDENTIAL				AGRICULTURAL				INDUSTRIAL				COMMERCIAL				OPEN SPACE			
	+2	+1	0	-1	+2	+1	0	-1	+2	+1	0	-1	+2	+1	0	-1	+2	+1	0	-1
• SOIL PRODUCTIVITY - SOIL SURVEY PP. 100-117	LO	MOD	HI	VHI	VHI	HI	MOD	LO	LO	MOD	HI	VHI	LO	MOD	HI	VHI			ALL	
• SOIL LIMITATIONS - USDA/SCS SHEETS	SLIGHT		MODERATE	SEVERE	AVERAGE OF 0-3% / VHI	3-8% / HI	8-12% / MOD	AND 12%+ / LO PRODUCTIVITY VALUES	SLIGHT		MODERATE	SEVERE	SLIGHT		MODERATE	SEVERE	SLIGHT	MODERATE	SEVERE	
• FLOODPLAIN - USDA/SCS SHEETS				FLOODING SOILS	OTHER FLOODING SOILS	ALLUVIALS; ORGANICS						FLOODING SOILS				FLOODING SOILS	FLOODING SOILS			
• FORESTED - AERIAL PHOTOS		YES					YES					YES			YES		YES			
• SANITARY SEWER - CITY ENGINEERS	0-1000'							0-1000'	0-1000'	1000'-1mi.		1mi.+	0-1000'	1000'-½mi.		½mi.+			ALL	
• ACCESSIBILITY (½ DISTANCE BETW. FRONTAGES) - HIGHWAY ENGINEER	OTHER PAVED	UNPAVED		SR+		PAVED	UNPAVED		SR+	OTHER PAVED		UNPAVED	SR+	OTHER PAVED		UNPAVED			ALL	
• RAILROADS/AIRPORTS (AJERAGED) - APC MAPS			300'+	0-300' / PROX.			ALL / PROX.		0-300'	300'-½mi / PROX.	½mi.+				300'+	0-300' / PROX.		0-300'	300'+ / PROX.	
• CURRENT USE - 1977 APC SURVEY + "WHAT'S ON DRAWING BD."	RES			AG-H/VH OS	AG			OS	IND			AG-H/VH OS	COMM			AG-H/VH OS	OS			AG-H/VHI

tippecanoe county area plan commission

20 north 3rd, lafayette, in.
(317) 423-9242 47901
terry l. virta, executive director

TO: Land Use Study File
FROM: Bernard Gulker, Senior Planner
SUBJECT: Final Pilot Study Matrix Revisions
DATE: August 4, 1978
REF. NO.: 493-78

The attached Second Revised Matrix has been modified from its predecessor in a couple of areas:

1. SOIL LIMITATIONS - OPEN SPACE - Attempts to define shades of limitation have been scrapped; the slight-moderate-severe breakout was relevant only to recreational development, which constitutes only a fragment of the broadly conceived notion of open space being used here. In essence soil limitations are irrelevant to this open space concept, and as such all soils will score zero for potential open space land use.

2. ACCESSIBILITY - The notion of extending the influence of the various road types to half the distance between frontages was scrapped as being thoroughly impractical to map. A half-mile strip methodology was substituted, with primacy given to "SR+" over "other paved" over "unpaved".

   In mapping the sanitary sewer factor, it has been decided that in addition to the 1000-foot, half-mile and mile strips surrounding the major sewer lines, to map existing (and drawing board) sewered facilities in the same color as the 1000-foot strip, but to continue to measure distances from the major lines only. Thus credit will be given to sewered land without sacrificing the notion that sewer expansion will come from the major lines only.

BG/ja

2nd REVISED LAND USE POTENTIALS MATRIX

FACTOR \ LAND USE →	RESIDENTIAL				AGRICULTURAL				INDUSTRIAL				COMMERCIAL				OPEN SPACE			
VALUE →	+2	+1	0	-1	+2	+1	0	-1	+2	+1	0	-1	+2	+1	0	-1	+2	+1	0	-1
• SOIL PRODUCTIVITY - SOIL SURVEY PP. 100-117	Lo	Mod	Hi	VHi	VHi	Hi	Mod	Lo	Lo	Mod	Hi	VHi	Lo	Mod	Hi	VHi			ALL	
• SOIL LIMITATIONS - USDA/SCS SHEETS	SLIGHT		MODERATE	SEVERE	AVERAGE OF SLOPE AND PRODUCTIVITY VALUES: 0-3% VHi; 3-8% Hi; 8-12% Mod; 12%+ Lo				SLIGHT		MODERATE	SEVERE	SLIGHT		MODERATE	SEVERE			ALL	
• FLOODPLAIN - USDA/SCS SHEETS				FLOODING SOILS	OTHER FLOODING SOILS	ALLUVIALS, ORGANICS						FLOODING SOILS				FLOODING SOILS	FLOODING SOILS			
• FORESTED - AERIAL PHOTOS		YES					YES					YES			YES		YES			
• SANITARY SEWER - CITY ENGINEERS	0-1000'							0-1000'	0-1000'	1000'-1 mi.		1 mi.+	0-1000'	1000'-½ mi.		½ mi.+			ALL	
• ACCESSIBILITY (WITHIN ½ MILE OF) - HIGHWAY ENGINEER	OTHER PAVED	UNPAVED		SR+		PAVED	UNPAVED		SR+	OTHER PAVED		UNPAVED	SR+	OTHER PAVED		UNPAVED			ALL	
• RAILROADS/AIRPORTS (Averaged) - APC. MAPS			300'+	0-300' PROXIM.			ALL PROX.		0-300'	300'-½mi PROX.	½ mi.+				300'+	0-300' PROX.		0-300'	300'+ PROX.	
• CURRENT USE - 1977 APC SURVEY PLUS "WHAT'S ON DRAWING B3."	RES.			AG-H/VH OS	AG.			OS	IND.			AG-H/VH OS	COMM.			AG-H/VH OS	OS			AG-H/VH

tippecanoe county area plan commission

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terry l. virta, executive director

TO: Land Use Study File
FROM: Bernard Gulker, Senior Planner
SUBJECT: Matrix Revisions
DATE: August 16, 1978
REF. NO.: 516-78

Attached are a "new" 2nd Revised Matrix and a 3rd Revised Matrix; 2nd Revised was used to generate Land Use Potentials Trial I, 3rd Revised to generate Trial II. The "new" 2nd Revised has a few labelling changes - to achieve consistency with the graphics being done - no changes in substance. New factor names are "Tendency to Flood", and "Current and Expected Use;" within the accessibility factor "SR+" has been changed to "ST./FED. HIWAY;" also "PROX" in the RR/Airport factor has been defined in a footnote. The mapping of the 36 X 36-cell Trial I, generated by the 2nd Revised Matrix showed up some problems in that matrix, most notably that not only were new development potentials not being created, but in many cases existing development was being lost to agricultural potential. Also a wide swath of commercial/industrial potential was being created along the state road corridors, in clear conflict with existing uses. The first problem was clearly attributable to an overemphasis on prime-ag preservation in the matrix; the second problem stemmed from creating an accessibility factor map with a mile-wide C/I influence attributed to the state roads. The prime-ag bias was the direct result of double- and triple-counting basically the same data: soil limitations and the presence of flooding soils were tripling up with soil productivity to give the ag potential a stranglehold on much of the township's acreage. Similarly, penalties for flooding soils merely served to penalize twice in instances of severe limitations for residential/commercial/industrial development potential. As a possible solution, 3rd Revised Matrix has no entry for soil limitations with regard to agricultural land use potential, and all indication of flooding soils has been eliminated except for open space potential where no multiple-counting has existed. The proposed solution to the overemphasis of commercial/industrial development potential within wide corridors surrounding state or federal highways involves redrawing the factor map so that such influence would be limited to within 300 ft. on either side of the state or federal roadway or ¼-mile of the intersection of two state or federal highways. The township was rescored for this factor (as part of Trial II) to include this reduced emphasis. Additionally, it was decided that to award a point to ag potential because of proximity to a paved road might well be incorrect; the rescoring as based on the 3rd Revised Matrix awards no points to ag potential for roadway accessibility.

The 3rd Revised Matrix, containing those changes described herein, has been used to generate Land Use Potentials Trial II, which indeed restores most existing development lost in Trial I, and projects considerable residential development potential within the sewered areas to the north as well as within some less productive current cropland to the south. The influence of SR 43 as it passes through the township to create some inappropriateely sited commercial/industrial development potential has been minimized. Trial II will thus be the model for the Proposed Land Use Plan, currently in preparation.

BG/ja

2nd REVISED LAND USE POTENTIALS MATRIX

-- USED TO GENERATE LAND USE POTENTIAL TRIAL I

FACTOR / VALUE → \ POTENTIAL LAND USE →	RESIDENTIAL				AGRICULTURAL				INDUSTRIAL				COMMERCIAL				OPEN SPACE			
	+2	+1	0	-1	+2	+1	0	-1	+2	+1	0	-1	+2	+1	0	-1	+2	+1	0	-1
SOIL PRODUCTIVITY	LO	MOD	HI	VHI	VHI	HI	MOD	LO	LO	MOD	HI	VHI	LO	MOD	HI	VHI			ALL	
SOIL LIMITATIONS	SLIGHT		MOD	SEVERE	AVERAGE OF SLOPE AND 0-3% / VHI PRODUCTIVITY	3-8% / HI PRODUCTIVITY	8-12% / MOD VALUES	12%+ / LO	SLIGHT		MOD	SEVERE	SLIGHT		MOD	SEVERE			ALL	
TENDENCY TO FLOOD				FLOOD-ING SOILS	OTHER FLOOD-ING SOILS	ALLU-VIALS, ORGAN-ICS						FLOOD-ING SOILS				FLOOD-ING SOILS	FLOOD-ING SOILS			
FORESTED		YES					YES					YES			YES		YES			
SANITARY SEWER	0-1000'							0-1000'	0-1000'	1000'-1 mi.		1 mi.+	0-1000'	1000'-½ mi.		½ mi.+			ALL	
ACCESSIBILITY (Within ½ mile of)	OTHER PAVED	UN-PAVED		ST/FED HIWAY		PAVED	UN-PAVED		ST/FED HIWAY	OTHER PAVED		UN-PAVED	ST/FED HIWAY	OTHER PAVED		UN-PAVED			ALL	
RAILROADS/ AIRPORTS			300'+	0-300' / PROX.*			ALL / PROX.*		0-300'	300'-½mi / PROX.*	½ mi.+				300'+	0-300' / PROX.*		0-300'	300'+ / PROX.*	
CURRENT AND EXPECTED USE	RES.			AG-H/VH OS	AG.			OS	IND.			AG-V/VH OS	COMM.			AG-H/VH OS	OS			AG-H/VH

* AIRPORT PROXIMITY (PROX.) IS AREA WITHIN 2000 FT. OF AIRPORT BOUNDARY PLUS AREA WITHIN 3000 FT. OF ENDS OF RUNWAYS.

3rd REVISED LAND USE POTENTIALS MATRIX

-- USED TO GENERATE LAND USE POTENTIAL IN TRIAL II

↓FACTOR / POTENTIAL LAND USE → VALUE →	RESIDENTIAL				AGRICULTURAL				INDUSTRIAL				COMMERICAL				OPEN SPACE			
	+2	+1	0	-1	+2	+1	0	-1	+2	+1	0	-1	+2	+1	0	-1	+2	+1	0	-1
SOIL PRODUCTIVITY	LO	MOD	HI	VHI	VHI	HI	MOD	LO	LO	MOD	HI	VHI	LO	MOD	HI	VHI			ALL	
SOIL LIMITATIONS	SLIGHT		MOD	SEVERE					SLIGHT		MOD	SEVERE	SLIGHT		MOD	SEVERE			ALL	
TENDENCY TO FLOOD																	FLOOD-ING SOILS			
FORESTED		YES					YES					YES			YES		YES			
SANITARY SEWER	0-1000'							0-1000'	0-1000'	1000'-1 mi.		1 mi.+	0-1000'	1000'-½ mi.		½ mi.+			ALL	
ACCESSIBILITY (Within ½ mile of)	PAVED	UN-PAVED		ST/FED HIWAY*			ALL		ST/FED HIWAY*	PAVED		UN-PAVED	ST/FED HIWAY*	PAVED		UN-PAVED			ALL	
RAILROADS/ AIRPORTS			300'+	0-300' / PROX**			ALL / PROX**		0-300'	300'-½ mi. / PROX**	½ mi.+				300'+	0-300' / PROX**		0-300'	0-300' / PROX**	
CURRENT AND EXPECTED USE	RES.			AG-H/VH OS	AG			OS	IND.			AG-H/VH OS	COMM.			AG-H/VH OS	OS			AG-H/VH

* EITHER WITHIN 300 FT. OF ST./FED. HIWAY RIGHT-OF-WAY, OR WITHIN ¼ MILE RADIUS OF THE INTERSECTION OF TWO ST./FED. HIWAYS.

** AIRPORT PROXIMITY (PROX.) IS AREA WITHIN 2000 FT. OF AIRPORT BOUNDARY PLUS AREA WITHIN 3000 FT. OF ENDS OF RUNWAYS.

tippecanoe county area plan commission

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terry l. virta, executive director

TO: Land Use Study File
FROM: Bernard Gulker, Senior Planner
SUBJECT: Matrix Revisions
DATE: September 18, 1978
REF. NO.: 565-78

Based on his discussions with the Chamber's Industrial Development Committee, Terry has requested a 4th Revised Matrix to be used to develop a Land Use Potentials map, Trail III. The changes made reflect the thinking that an industrial firm will locate more than a mile from a suitably sized sanitary sewer trunk line, and also exhibit a continued diminution of the primacy of prime agricultural land in the decision-making model.

The following changes have been made in the matrix:

-Sanitary Sewer/Industrial - the influence of a major trunk line has been extended from 1 to 1½ miles; score +1 for the range between 1000 feet and 1½ miles, and -1 beyond 1½ miles. A Concept II Graphic has been executed.

-Current and Expected Use - to eliminate double-counting the impact of prime agricultural land (Soil Productivity and Current and Expected Use), the conversion penalty in the Current and Expected Land Use factor has been dropped. Additionally the IDC (or its members) will provide information to indicate those sites that industry is expected to occupy in the near future. This data will be included in a revised Current and Expected Land Use Map, and is essentially analogous to our inclusion of platted-but-as-yet-unbuilt residential subdivisions.

BG/mc

4 th REVISED LAND USE POTENTIALS MATRIX

-- USED TO GENERATE LAND USE POTENTIAL IN TRIAL III

FACTOR ↓ / POTENTIAL LAND USE → / VALUE →	RESIDENTIAL				AGRICULTURAL				INDUSTRIAL				COMMERCIAL				OPEN SPACE			
	+2	+1	0	-1	+2	+1	0	-1	+2	+1	0	-1	+2	+1	0	-1	+2	+1	0	-1
SOIL PRODUCTIVITY	LO	MOD	HI	VHI	VHI	HI	MOD	LO	LO	MOD	HI	VHI	LO	MOD	HI	VHI			ALL	
SOIL LIMITATIONS	SLIGHT		MOD	SEVERE					SLIGHT		MOD	SEVERE	SLIGHT		MOD	SEVERE			ALL	
TENDENCY TO FLOOD																	FLOOD-ING SOILS			
FORESTED		YES					YES					YES			YES		YES			
SANITARY SEWER	0-1000'							0-1000'	0-1000'	1000'-1½ mi.		1½ mi.+	0-1000'	1000'-½ mi.		½ mi.+			ALL	
ACCESSIBILITY (Within ½ mile of)	PAVED	UN-PAVED		ST/FED HIWAY *			ALL		ST/FED HIWAY*	PAVED		UN-PAVED	ST/FED HIWAY*	PAVED		UN-PAVED			ALL	
RAILROADS/ AIRPORTS			300'+	0-300' / PROX**			ALL / PROX**		0-300'	300'-½ MI / PROX**	½ MI.+				300'+	0-300' / PROX**		0-300'	300'+ / PROX**	
CURRENT AND EXPECTED USE	RES.			OS	AG			OS	IND.			OS	COMM.			OS	OS			

* EITHER WITHIN 300 FT. OF ST./FED. HIWAY RIGHT-OF-WAY, OR WITHIN ½ MILE RADIUS OF THE INTERSECTION OF TWO ST./FED. HIWAYS.

** AIRPORT PROXIMITY (PROX.) IS AREA WITHIN 2000 FT. OF AIRPORT BOUNDARY PLUS AREA WITHIN 3000 FT. OF ENDS OF RUNWAYS.

tippecanoe county area plan commission

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TO: Land Use Study File
FROM: Bernard Gulker, Senior Planner
SUBJECT: Matrix Revisions
DATE: October 25, 1978
REF. NO.: 669-78

The Wea Township Pilot Study is, effectively, complete: 4th Revised Matrix was used to generate Trial III using Concept II factor maps for sanitary sewer availability and current and expected land use as per the previous memorandum. A full set of gridded relative potential maps were generated, one for each potential land use category. The term "quartile" was changed to "quarter-interval" to better reflect the fact that only the positive scores (plus zero) have been quartered and assigned relative potential levels. Actually, only the Relative Agricultural Potential graphic is assured of permanent value in that the other land use category top scores may yet be surpassed as the entire County is scored (see below with regard to Open Space).

A 5th Revised Land Use Potentials Matrix has come into being, largely for housekeeping reasons. Thus a typo has been corrected at RR/Open Space/O, and airport "proximity" has been properly defined to match the actual usage which has been correct all along. As the Study moved into Fairfield Twp. a new roadway accessibility scoring problem arose: Interstate 65.

It was decided to mark the sphere of influence of the I-65 intersections in ¼-mile radii from each entry/exit ramp intersecting other roadways. Additionally, the 300-foot strips to the sides of the Interstate (much like those along the State/Fed hiways) were assigned specific values in recognition of their limited access nature. Thus Res. potential scores -1 for location within 300 feet (as per State/Fed hiways), but Ind. and Comm. score 0 (rather than State/Fed +2) because lack of access precludes any locational advantage. The sphere of influence at the intersection was given primacy over the right-of-way strip because of the potential for access.

These changes actually have no effect on the scoring. However it was decided to award a point for Open Space potential within the **strips** along the Interstate. This would serve the dual function of promoting the visual amenity along the roadway and penalizing conversion to a more noise and odor sensitive use such as housing. As a result, highest possible Open Space score rises from seven (already achieved) to eight.

The actual Land Use Study is now progressing with factors being mapped and scored for Fairfield, Sheffield, Wabash and Union Townships. We are particularly curious about Ind. potential west of Dayton and Res. potential in Uion Twp.'s so-so soils, which may prove a better producer of houses than crops.

BG/ja

5 th REVISED LAND USE POTENTIALS MATRIX

---USED TO GENERATE LAND USE POTENTIAL ON A COUNTY-WIDE BASIS

FACTOR / POTENTIAL LAND USE → VALUE →	RESIDENTIAL				AGRICULTURAL				INDUSTRIAL				COMMERCIAL				OPEN SPACE			
	+2	+1	0	-1	+2	+1	0	-1	+2	+1	0	-1	+2	+1	0	-1	+2	+1	0	-1
SOIL PRODUCTIVITY	LO	MOD	HI	VHI	VHI	HI	MOD	LO	LO	MOD	HI	VHI	LO	MOD	HI	VHI			ALL	
SOIL LIMITATIONS	SLIGHT		MOD	SEVERE					SLIGHT		MOD	SEVERE	SLIGHT		MOD	SEVERE			ALL	
TENDENCY TO FLOOD																	FLOOD-ING SOILS			
FORESTED		YES					YES					YES			YES		YES			
SANITARY SEWER	0-1000'							0-1000'	0-1000'	1000'-1½ mi.		1½ mi+	0-1000'	1000'-½ mi.		½ mi.+			ALL	
ACCESSIBILITY (SEE NOTES BELOW)	PAVED 0-½ mi	PAVED ½ mi+		MAJOR INSCTN or R-O-W			ALL		MAJOR INSCTN ST/FED R-O-W	PAVED 0-½ mi	I-65 R-O-W	PAVED ½ mi+	MAJOR INSCTN ST/FED R-O-W	PAVED 0-½ mi	I-65 R-O-W	PAVED ½ mi+		I-65 R-O-W	ALL OTHERS	
RAILROADS/ AIRPORTS (SEE NOTES BELOW)			300'+	0-300' / PROX			ALL / PROX		0-300'	300'-½ mi. / PROX	½ mi+				300'+	0-300' / PROX		0-300'	300'+ / PROX	
CURRENT AND EXPECTED USE	RES.			OS	AG			OS	IND.			OS	COMM.			OS	OS			

NOTES: ACCESSIBILITY - "MAJOR INTERSECTION" MEANS THE AREA WITHIN ½-MILE RADIUS OF EITHER THE INTERSECTION OF TWO STATE AND/OR FEDERAL HIGHWAYS, OR THE INTERSECTION OF ALL INTERSTATE HIGHWAY ENTRY AND/OR EXIT RAMPS WITH ANY OTHER ROADWAY.

- "STATE/FEDERAL RIGHT-OF-WAY" AND "INTERSTATE 65 RIGHT-OF-WAY" (EITHER = "MAJOR R-O-W") MEAN AREAS WITHIN 300 FEET OF THE ACTUAL RIGHTS-OF-WAY. (I-65 R-O-W IS SUPERCEDED BY ITS CORRESPONING MAJOR INTERSECTION).

AIRPORTS - "PROXIMITY" MEANS AREA WITHIN 2000 FEET OF AIRPORT BOUNDARY PLUS 3000-FOOT WIDE BY ONE NAUTICAL MILE LONG AREAS BEGINNING AT ENDS OF RUNWAYS.